THE

ELECTRICAL REVIEW.

VOL. LXV. JULY 2, 1909. No. 1,649.

ELECTRICAL REVIEW.

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THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. *Established 1872.*

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGEEKAY, LONDON." Code, A B C.

Telephone Nos.: Holborn 988; Central 4125 (Editorial only).

ALL Letters should be addressed to the Proprietors, H. Alabaster, Gatehouse & Co.

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SUBSCRIPTION RATES.—Per annum, postage inclusive, in Great Britain, 19s. 6d.; Canada, £1 1s. 8d. ($5.30). To all other countries, £1 10s.

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READING CASES, to hold from One to Twenty-six Numbers until the volume is complete for Binding, can be had from the Publishers, Price 6s., or Free by Post (in Great Britain), 6s. 6d.

FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOYVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

Cheques and Postal Orders (on Chief Office, London) to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

THE
UNIVERSAL ELECTRICAL DIRECTORY
(J. A. BERLY'S).

1909 EDITION

H. ALABASTER, GATEHOUSE & CO.,
4, Ludgate Hill, London, E.C.

AN ENGINEER'S CERTIFICATE.

THE case of Musgrave & Sons, Ltd., *v.* The Bradford Corporation, of which we published a report in our issue of June 25th, affords an example of the difficulties which sometimes beset the contractor who is bound by the certificate of an engineer.

The contractor may well feel inclined to rub his eyes on perusing a report of this case. It was clear upon the evidence, and was decided by a judge of the High Court, that an engineer had unreasonably withheld his certificate; nevertheless, the contractor was held bound by his refusal!

A glance at the decision on the subject makes it plain that this part of the case was decided in accordance with the law. It has been clearly held that an action will not lie on a building contract for money payable upon an architect's certificate without its production or proof of waiver of production, and such waiver will not easily be inferred. Indeed, it may be said that a certificate can only be dispensed with by proving fraud. As Lord Lindley said in one case: "The certificate, of course, might be impeached for fraud; it might be impeached for collusion; on the other hand, it cannot be impeached for mere negligence, or mere mistake, or mere idleness on the part of the architect" (see Clemence *v.* Clarke, 1789, 2 H.B.C. 207).

That, of course, was the case of an architect; but the principle underlying it applies with equal force to the case of an engineer. His certificate is equally binding—not only on the contractor but on the employer also. One example of this should suffice. In Dunaberg Railway *v.* Hopkins and Co., 36 L.T.N.S. 733, the defendants contracted with the plaintiff, a railway company, to supply rails of a certain pattern and sample, to be inspected by the engineer. The rails were supplied and found satisfactory by the engineer, but after delivery it was discovered that they were defective. The employer sued for breach of contract. It was held that the company had no right of action, as it was the intention of the parties in the construction of the contract to make the satisfaction of the engineer final, and to take away any subsequent right of action.

We have seen that fraud or collusion constitutes a ground for setting aside or dispensing with an engineer's certificate. It may be said, with some show of reason, that it is difficult at any time for the engineer employed by one party to a contract to act with propriety as mediator in the contract. The question whether or not a certificate is to be granted is really an issue between the contractor and the employer. But the contractor knows all about this before he signs the contract. As Lord Justice Bowen said in Jackson *v.* Barry Railway Co., 1893, 1 ch. 238: "An engineer could not be expected, nor was it intended, that he should come with a mind free from preconceived opinion. The perfectly open judgment, the absence of all previously formed or pronounced views, which in an ordinary arbitrator are natural and to be looked for, neither party

proposed to exact from the arbitrator of their choice. They knew well that he probably must be committed to a prior view, and that he might not be impartial in the ordinary sense. What they relied on was his professional honour, his position and his intelligence."

While the contractor cannot complain about bias which he knows of before signing the contract, it is otherwise if it turns out that, unknown to one party, the engineer is biased or has formed an opinion. "A perfectly even and unbiased mind is essential to the validity of every judicial proceeding. Therefore, when it turns out that, unknown to one or both of the persons who submit to be bound by the decision of another, there was some circumstance in the situation of him to whom the decision was entrusted which tended to produce a bias in his mind, the existence of that circumstance will justify the interference of the Court" (per Stuart, V.C., in Kemp *v.* Rose, 1858, 1 Gibb 258). What happened in that case was that an architect, unknown to the builder and previously to a contract being signed, gave an assurance to his employer (but declining to bind himself by any guarantee) that a building would not exceed a certain amount, upon the faith of which the employer embarked in the undertaking. It was held, without alleging fraud, that the architect's decision was not binding on the builder, if there was the smallest speck or circumstance which might unfairly bias his judgment which was unknown to the builder.

A fortiori, if an actual fraudulent agreement can be proved, a certificate may be set aside, or it may be held not to be a condition precedent to the right to sue.

Fraud is an ugly word; but, in the absence of fraud, it is a well-nigh superhuman task to set aside a certificate. These are precepts which every contractor should bear in mind before he consents to sign any contract which binds him, hand and foot, to the employer's engineer.

Municipal Ethics.

In giving judgment on the case mentioned above, his Lordship stated, among other things, that the engineer did refuse the certificate for the purpose of *obtaining an obligation from the plaintiffs, to which he was not entitled under the agreement*, but he thought he tried to do so because he was not satisfied with the engine—*although he ought to have been;* but as the engineer did not act in collusion with the Corporation, the action failed on legal grounds, in the absence of the engineer's certificate.

Though the Bradford Corporation obtained a legal victory, it must be said that the moral victory rested with the engine builders; owing to the one-sided and unfair clause in the contract, it did not make any difference whether the engine was good or bad, or whether the technical contentions of the engineer were right or wrong—the Corporation could refuse payment as long as the engineer considered himself dissatisfied, and refused the certificate. It may be impossible to force an engineer to give his certificate, even though it has been decided that the engineer is technically in the wrong, but there is very little doubt in the mind of any right-thinking man as to what, apart from any legal obligations, the Corporation *ought* to do under the circumstances.

It would be interesting to see what would happen if ordinary commercial contracts were arranged on the municipal plan. The world's business would in a few weeks be reduced to a state of chaos.

Speaking generally, and quite apart from the above case, the omission of an arbitration or similar clause for the protection of a contractor from an agreement is a clear confession of weakness or technical incompetence on the part of the engineer. An engineer worthy of his profession, who believes in his own sense of justice and technical ability, will not hesitate to refer his action to an arbitrator or independent tribunal, and in the case of an adverse verdict will admit that even the greatest man is liable to mistakes, and that there are two sides to every question.

For many generations the Englishman has been noted among the nations of the world for his sense of fair play and business integrity; though stress of competition, American hustle, and the presence of many not too conscientious financiers in our midst have lowered the standard of commercial morality, the Englishman of to-day has still something in this direction to be proud of.

It would be thought at first sight that municipal bodies would become models of fair play and straight dealing, in their relations with the commercial world, but the repeated complaints heard of one-sided contracts and sharp practice show that there is a good deal to be desired. It must be said that this more frequently arises from excessive official zeal, thoughtlessness and desire to appear smart than from any deep-seated vice or wish to be unfair.

A few days ago a very serious criticism of the Budget was made by the Lord Chief Justice, on the ground that it introduced a new principle into English law by denying the right of the taxpayer to appeal to an independent body or court of law in the case of disagreement over the taxation of land or income, any disagreements between the taxpayer and assessors being referred to an interested Treasury official, whose decision was to be final, contrary to the principle with regard to civil disagreements which has existed in this country almost since Saxon times. He probably was not aware that for the last 10 years many municipalities have violated this national principle in their machinery contracts, refusing the right of arbitration, and by means of carefully-worded clauses have practically contracted out of the law, and arranged so that in cases of dispute, the borough engineer or other official can assume the *rôle* of plaintiff or defendant, judge, jury, Court of Appeal and House of Lords, all in one; in fact, become a sort of technical and legal "Pooh-Bah."

When a contractor receives a specification for machinery, it is very usual to assume that where one-sided clauses exist the municipality will have too much self-respect to put them into action, except in cases of downright dishonesty on the part of the contractor; but this is evidently a dangerous and illusory assumption. It should not be impossible for the leading electrical contractors to come to a mutual agreement and refuse to sign contracts containing such clauses; largely owing to the concerted action of the manufacturers, the terms of contract of the leading Continental municipalities are much more equitable with regard to payments and conditions than those in this country. The Institution of Electrical Engineers has drawn up model conditions of contract, but they do not go far enough.

Public bodies are the servants, not, as many people wish them to be, the masters of the public, and while even contractors are not all saints or all black sheep, it should be in the interest of everybody to uphold that standard of commercial morality for which this country has long been so justly famous.

Charging for Electricity.

Under Sec. 32 of the Electric Lighting (Clauses) Act, 1899, the principle is established of a compulsory revision of the maximum prices for electrical energy every seven years, and Clause 20 of the Electric Lighting Act, 1882, provides that in making agreements for a supply of electricity, the undertakers under provisional orders shall not "show any undue preference to any local authority, company or person." These provisions recognise, in the first place, that changes in the conditions of supply are to be anticipated in the development of electrical undertakings; and, secondly, (from the grandmotherly point of view), the necessity for the protection of the consumers.

The right under the Act to demand an inquiry into a revision of prices rests with the local authority (if not themselves the undertakers), or with the suppliers under the provisional order, so that if individual consumers desired the protection of this clause of the Act, they would have to make their application through the local authority.

In some cases provisional orders contain variations in the term for revising prices; for example, under an order granted in 1900, there is an alteration, in the following words:—

"Sec. 32 of the schedule to the Electric Lighting (Clauses) Act, 1899, shall, as incorporated with this Order, be read, as if, as respects the revision of price authorised by that section, two years were substituted for seven years." But the usual clause in provisional orders is as follows:—"The maximum prices which may be charged by the undertakers as mentioned in Sec. 32 of the schedule to the Electric Lighting (Clauses) Act, 1899, are those stated in the fourth schedule to this Order."

The question of undue preference involves *similarity in the conditions of supply*, and this allows for the necessary freedom in making contracts for exceptional demands. It is absurd to suppose, for instance, that a sausage maker employing a small motor for a few hours a week should be able to claim a supply of power on the same terms as a chemical factory working day and night, and taking hundreds of thousands of units, or that consumers during the peak of the load should be charged the same as those only requiring a supply during the day-light hours.

In considering the question of the proper charge for energy during a new period of, say, five or seven years, many interesting points arise which require the utmost skill of the parties concerned to deal with. For example, the actual and probable improvements in the cost of the energy have to be considered, and in this respect the development of the undertakings for supplying electricity in bulk over large areas plays a very important part. Instead of generating a comparatively small amount of electricity in local works, with dear coal and other disadvantages, the power company supplies at a considerably lower cost, besides saving capital outlay and expenses in management.

This development is seen in the closing down of local generating stations established a few years ago and limiting them to the distribution of electricity received in bulk from distant power supply works.

As an instance of the economy of this "up-to-date" system, we will take the case of a small local company in the North of London—which commenced supply about seven years ago from a self-contained plant—with steam power, but which now takes all its energy in bulk from a power station. In the last year of generating locally, the cost per unit sold was 3·306 pence, whereas under the arrangement for taking all the energy in bulk from the power supply company, the cost is reduced to 1·872 pence.

Cases arising out of the revision of prices clause of the Act have not been numerous, but one is now *sub judice*, to which we shall refer when the award of the arbitrator appointed by the Board of Trade is made; meanwhile, the evidence in the case has been given, embodying many points of interest, the price charged being the subject of a sliding scale agreement with a special clause for revision of rates after a term of years.

The Human Factor in Commercial Illuminating Engineering.

In the June issue of the American *Electrical Record*, Dr. Louis Bell emphasises some instructive points in an entertaining manner, regarding the difficulties which the illuminating engineer experiences in dealing with those who require their lighting improved.

In America, illuminating engineering is a science *in esse*, whilst here it is still *in posse*. It is true that there is now an Illuminating Engineering Society amongst us, but to a large extent, for the present, we are bound to get our information from American sources, and it is interesting to note, in this connection, that those who have had practical experience are not slow to communicate it to the electrical papers. It appears, as Dr. Bell picturesquely puts it, that those who undertake the science commercially are "forthwith led by the nose up to the strenuous life," or to put it more plainly, "ordinary illuminating engineering deals with the application of artificial sources of light to practical illumination, while the commercial kind has to do with their application to human nature." We all know the man who thinks that he is getting most light when the source of illumination is staring him in the face. Try to persuade him that he will get most illumination by shading that light or putting it out of the range of vision, and he thinks we do not know our business. So much about illuminating engineering we do know, however, and we are able, therefore, fully to appreciate the difficulties they are having in America. Again, an architect designs a Gothic or Georgian interior, with sombre decorations, and only allows for lighting it with the conventional candle sconces, quite forgetting that the people of those times either could not read or did not trouble to do so, whilst nowadays man does as much of his work by artificial light as by natural light. Try to get the architect to provide for a proper system of reflected illumination, and he calls us wanting in the artistic sense. Dr. Bell classifies consumers in respect of illuminating engineering as follows:—The majority, who require their bills reduced; a large minority who want better light at the same, or less, cost, with a few who want better light "anyhow." The first class, being generally fairly well lighted, no doubt owing to their rooms being small, are not difficult to deal with. The second class, who consider reduced bills a secondary matter, are necessarily badly lighted, and this is generally owing to some fault of the decorator or architect. But both classes, being only human, have their own ideas, and the illuminating engineer has often to make a compromise in order to satisfy them. We are told, however, that most people seem to "catch on" to the drift of what the expert is aiming at, although they may, and will, alter details to their own disadvantage. This is information that we might have been led to expect, but it would be as well to be prepared, in this country of conservatism and conventions, for greater opposition than is experienced in America. It is of no use to attempt to ram new ideas down people's throats (to quote a mixed metaphor), but to proceed carefully, tactfully and without undue haste. The human factor cannot be neglected, and, no doubt, this point of view will present itself to those who are about to undertake the uphill work on this side of the Atlantic.

The Birthday Honours.

As usual, there is little encouragement meted out to electrical or engineering men in the list of Birthday Honours—presumably it is because they do not take sufficient active interest in matters political. Everybody will be ready to congratulate Dr. Joseph Larmor, F.R.S., the secretary of the Royal Society—whose deep knowledge of mathematical and physical science always commands for him an attentive and interested audience at the British Association gatherings, or wherever else he may occupy the platform—upon the knighthood which has been conferred upon him, an honour as well merited as any in the list, regarded from our point of view. Sir Robert Hunter, the solicitor to the Post Office, is made a C.B. Mr. John Newlands, Officer on Special Duty in connection with the reorganisation of the Indian Telegraph Department, receives the order of C.I.E., as does also Mr. H. A. Kirk of the India Office, late Director in Chief, Indo-European Telegraph Department. Mr. Thomas Briggs, the vice-controller of the London Postal Office, and Mr. J. K. Logan, superintendent of Electric Lines, Post Office and Telegraph Department of the Dominion of New Zealand (incidentally it may be mentioned that Mr. Logan represents the interests of the I.E.E. in that quarter of the globe), are both appointed to be Companions of the Imperial Service Order. To all of these we extend our hearty congratulations. They are good as far as they go, but they do not go far enough. Many of our readers will easily call to mind the names of men who have rendered sterling service in connection with the science and practice of electrical and other branches of engineering, or who are by virtue of their great learning in these departments creditable ornaments thereto, the public recognition of whose claims is overdue. We think of men who could carry national honours with appropriate credit and dignity, and who would in these days of easily-won political honours, help better to ensure a continuance of a high standard among those elected by His Majesty's advisers to carry our national distinctions.

THE I.M.E.A. CONVENTION.

Now that the 1909 Convention has become a thing of the past, and we have had time to ponder over the doings of the week and their more immediate results, we must confess to a feeling that the meetings, at any rate, did not come up to the level of former years; this more particularly applies to the discussions, which were more remarkable for quantity than for quality.

Of course, it must be admitted that the executive are likely to be faced with increasing difficulty in obtaining suitable papers, as owing to the growth of local engineering societies, and more particularly of the provincial centres of the I.E.E., where engineering matters are promptly dealt with, as well as to the general acceptance of supply methods, as dictated by experience, the matters which may be profitably discussed are strictly limited. The social side of these meetings must, however, remain a very valuable feature.

In our last issue we referred to the earlier doings of the week; on Wednesday a special train conveyed the members to Liverpool, where, in St. George's Hall, Messrs. Hoadley's and Hollingsworth's papers were read and discussed.

The former paper will be found in this issue; so far as electricity revenue is concerned, the influence of metallic-filament lamp was clearly demonstrated, but we were left somewhat in doubt as to how far the loss in revenue has been compensated for by the good commissions in the case of those who are dealers in lamps as well as light.

Arising out of this it appears that some engineers are rather worried over the long and efficient life of the new lamp and its falling price, and it is further interesting to note that an attempt has been made to improve its efficiency at the expense of burning hours, but without success.

Mr. Hollingsworth's paper on cable systems and its discussion were both curtailed owing to lack of time, which was a matter for regret.

There is no orthodox cable system, and, evidently, near neighbours are quite opposed as to the most suitable type of cable to use for similar work. One matter, however, which was mentioned by several speakers, and which will sooner or later require the serious attention of the Association, is overhead mains. There is a growing disposition in favour of these in certain circumstances, and there is no doubt that, granted a more consistent and less obstructive policy—in fact, a common-sense attitude—on the part of the Board of Trade, engineers generally would, by making greater use of such systems, open up their areas more rapidly than they can under present expensive conditions.

The Corporation luncheon at Liverpool took place in the Exchange Hotel, where, owing to the large attendance and limited accommodation, a division of forces was necessary. However, as regards our particular group, this arrangement proved a very happy one, and we cannot let it pass without recording our appreciation of the astute chairmanship of Ald. Lloyd, of the Tramways Committee.

The afternoon was spent mainly in special tramway cars, Lister Drive being visited in the first place, and subsequently the Cunarder *Mauretania*.

The turbine section of the Lister Drive station had been thoroughly spring cleaned in expectation of visitors, and those who anticipated finding any skeletons were agreeably disappointed, as both the Westinghouse and Curtis plants were apparently upholding their makers' reputations.

As to the visit to the *Mauretania*, the less said the better; those who expected nothing were not disappointed. The vessel being under lock and key, and time being strictly limited, nothing remained but a walk round the decks, and to make our way back to the Central Station *en route* for Manchester.

At Thursday's meeting, Mr. Blackman's turbine and Mr. Lunn's condenser papers were read and jointly discussed, and quite appropriately the majority of the members visited the Westinghouse Works at Trafford Park in the afternoon, where recent examples of such plant were on view. The discussion did not produce any noteworthy expression of opinion from the users, the latter being apparently very well satisfied with their turbine acquisitions.

The visit to Trafford Park was the most important of the week, and as the company had made every provision for the reception of its guests, the tour round these huge works, which deal with every type of prime mover and electrical plant, proved of more than ordinary interest.

Of special interest were the new 5,000-KW. Westinghouse-Rateau impulse turbines for the L.C.C., in which the mechanical features of the blading, and as regards the electrical end, the sound mechanical construction of the stator, attracted general attention. A considerable number of single and double flow and mixed pressure turbines, Le Blanc jet and surface condensers, also gas engines galore, were on view in the mechanical section, whilst generators, motors, transformers and switchgear of every description were also shown, including examples of the new radial brush gear fitted to direct-current turbo-generators. Later in the day, the annual dinner was held at the Midland Hotel, under the chairmanship of the President, who was supported by the Rev. Bishop Welldon, the Lord Mayor, Sir Thos. Shann, and many others well known in municipal and electrical circles; speeches and music occupied the later stages of the evening, which passed off very successfully.

Friday, the last day of the Convention, was reserved for the annual general meeting, at which the principal business was the election of Mr. W. W. Lackie as President for the coming year, and the decision that Glasgow should be the venue of next year's conference. The new council and its officers are as follows:—

President, *W. W. Lackie (Glasgow).
Sen. Vice-President, *J. Christie (Brighton).
Jun. Vice-President, *G. Wilkinson (Harrogate).

Past-Presidents.

*J. E. Edgcome (Kingston-on-Thames). *H. Talbot (Nottingham).
*S. E. Fedden (Sheffield). *S. L. Pearce (Manchester).

Council.

Coun. Howarth (Manchester).	*Charles Furness (Blackpool).
Coun. Sinclair (Swansea).	*F. M. Long (Norwich).
Ald. J. P. Smith (Barrow).	*J. E. C. Shawfield (Wolverhampton).
Ald. West (Coventry).	*T. P. Wilmshurst (Derby).
Ald. Wilkinson (Luton).	*A. C. Cramb (Croydon).
Baillie Willock (Glasgow).	*A. A. Day (Bolton).
*V. A. H. McCowen (Salford).	*H. Richardson (Dundee).

Hon. Solicitor, Ald. G. Pearson (Bristol).
Hon. Treasurer, *J. E. Edgcome (Kingston-on-Thames).
Hon. Secretary, *H. Faraday Proctor (Bristol).
Secretary, C. McArthur Butler.

* Engineers.

Some discussion took place on the Council's report, more particularly in regard to Lord Avebury's amendment to the original Clause 15 in the Electric Lighting Acts (Amendment) Bill, which particular clause was intended to empower local authorities to provide and hire out fittings, &c.

Eventually the question of dropping Clause 15, unless it could be passed in its original form, proposed by Mr. Faraday Proctor, or, as a alternative, adopting an amendment by Mr. Hoadley, that, if it were not possible to obtain the original clause, it should be accepted in its amended form, was put to the vote, the resolution being carried. The amendment, however, secured considerable support.

One cannot pass over the business meeting without reference to the valuable services rendered by Ald. Pearson, the legal "inquire within" of the Association—a sort of village pump (as he suggested) because everybody went to him.

This year's Convention was attended by very ill-luck in the matter of weather, nor can it be said that the choice of the large lecture hall in the Municipal School of Technology for the meetings was a particularly happy one, owing to the extreme difficulty in hearing the average speaker.

In Mr. S. L. Pearce the Association had an excellent president, whose ability and experience in electrical matters generally, and in municipal electrical matters in particular, are unquestioned; and we have every reason to believe that in selecting Mr. W. W. Lackie as president for the coming year, an equally appropriate choice has been made. For the rest, the Glasgow authorities may be trusted to make the Association as much at home as if they were over the border, perhaps a little more so.

The Influence of Metallic-Filament Lamps on the Electrical Industry and on Street Lighting.

By E. E. Hoadley, Chief Electrical Engineer, Maidstone.

(*Abstract.*)

From the point of view of most manufacturers of generating plant, the metal lamp is anything but a blessing. For the past two or three years extension of plant, except in a few favoured localities, has been slow enough, and on top of this comes an invention which will certainly keep the peak load in a generating station from rising at anything like its normal rate for a year or two to come, and in many cases will actually reduce it; and it is the peak load which determines whether extension plant is wanted or not. Cable makers may not be so unfortunate, as with the undoubted lessening of lighting cost to the consumer, people who have hitherto held back on the score of price may become consumers; and to supply them, mains will have to be run.

On the manufacturing side, the reapers of the harvest brought about by metal lamps will be first and foremost the lamp makers themselves; next, the accessory makers and wiring contractors should reap a decided benefit.

We now come to the point of view of the supply station engineer. The result of the introduction of the metal lamp varies according to whether the station supplies alternating or continuous current, whether the output is solely for lighting or is made up of power, lighting and traction; and if the supply is practically a lighting supply, whether that supply has a large proportion of shop lighting or is to a great extent residential. Taking the case of the A.C. stations first, these may be roughly divided into two classes—those stations in manufacturing districts supplying two or three-phase current and having a large proportion of their output used for power; then there are the single-phase stations, most of them of somewhat ancient date and generally supplying an area in which the demand is chiefly for the lighting of residential property. It is undoubtedly the latter class that will feel the pinch first and will feel it hardest, as practically all the circumstances are against them. The property they supply is the better class houses, whose owners will face the outlay demanded by a transformer and metal lamps with equanimity. Not having a large late-closing shop demand, the raising of the standard of illumination will not help them very much, as it is not so much increased light for the same amount of money that the consumer will go in for, but the same amount of light for a greatly reduced amount of money. It is doubtful if new consumers will come along fast enough to take all the units that existing consumers will save; even if they do, it means that the capital charges per unit sold will be increased, as although the generating plant will not need addition, yet new mains and services must be provided, and in the residential towns these are generally an expensive item per consumer, and with the poor load factor generally prevalent capital outlay should be kept as low as possible.

To stations of this class it must be confessed that the outlook is not a particularly rosy one for the next few years, and it can hardly be wondered at that several are considering the raising of prices In some special cases this may be the right policy, but the author is of opinion that what may be called the domestic uses of electrical energy should be pushed as widely and as hard as possible—heating and cooking in the better-class houses are not exploited nearly as much as they should be.

Where an A.C. station has the benefit of a good shop-lighting load and at the same time supplies a fair amount of power, the metal lamp should be looked on as a blessing, for the amount of harm done to the revenue account now will be amply repaid later on.

Most engineers of D.C. stations, particularly of those where the pressure is 200 volts or over, look with distinct favour on the lamp, but even they must look further than some of them have done up to the present. The time must be faced when a lamp of 16 C.P., or even less, can be obtained for all pressures commonly in use, and at a price which will be but little in advance of the selling price of the ordinary carbon-filament lamp. There is plenty of precedent for a great lowering of the price, and in spite of what the lamp-makers say as to the fine margin of profit at present prices, the reduction is bound to come.

To get the utmost good from the metal lamps it is practically certain that most central stations owned by municipalities must have legal rights and privileges which they do not at present possess. In the opinion of the author the first and foremost necessity is that municipal bodies generally should have the power to raise money for the purposes of wiring houses and other premises, for letting out cooking and heating apparatus as well as motors on hire and hire-purchase. Most municipal bodies would be quite satisfied if the powers were granted with the proviso that the wiring work should be done by contractors; with regard to cooking and heating apparatus, how many contractors could truthfully say that an appreciable source of income will be taken from them if the supply authority is allowed to hire heating-stoves, ovens, and things of like nature, it being understood that the wiring for these is done by a contractor? In this connection, if it be good law for some 44 towns to possess these powers, then how stupid it is for the rest to be denied them unless they go to the expense of a special Act; further, if it be fair and just for the gas companies themselves to do all these things, and many others besides, is it more unfair to the electrical contractors than to gas fitters that electricity supply authorities should possess equal or similar powers? Electrical engineers have too long been content to sell the consumer electricity, whereas it is light or heat that he buys, and it is vital to the interest of the supply authority to see that he is satisfied with the amount of heat or light that he gets for the money he pays. But how can this be done when the supply authority is bound down by silly restrictions? A determined effort should be made to get these necessary powers.

Next to the above comes the necessity for cheaper wiring. The author can state from his own experience that the Continental system of flexibles on special insulators requires a lot of beating—among other places, he has tried it in the damp warm atmosphere of a conservatory for 18 months without the slightest trouble. With cheap wiring, the necessary powers to hire out cooking and heating apparatus, wiring and fittings, and the improvements in cooking and heating apparatus which are bound to come with extended experience, most central stations should be able to look on the metal lamp as an ally and not as an enemy; to the above advantages should be added the very important fact of a large reduction in the selling price of the lamp. From 8d. to 10d. a week is about the average revenue obtained from a working man for light, and this serves to show how ridiculous it is to ask him to buy lamps at 4s. 9d. each, when he can get a gas mantle for 4d.

That there will be a diminution in revenue from lighting consumers cannot be denied, as although the standard of lighting demanded will undoubtedby be increased, yet it will be in very few cases that the standard of illumination will be raised some three and half times.

In the field of public street lighting the importance of the new invention cannot be over-estimated; the author feels sure that when engineers and Committees responsible for the lighting of streets have fully realised the possibilities of a lamp with an efficiency of approximately 1 watt per candle-power, that can be obtained in single units, giving candle-power ranging from 50 to 1,000, there will be many schemes of street lighting by arc lamps and by incandescent gas that will be altered and modernised.

An ordinary 60-watt metal lamp without any reflector will, from the point of view of the ordinary public, produce the same results as a good gas mantle in the heyday of its youth, while with reflectors the effect can be considerably increased. The other advantages, from an electrical point of view, are that no special mains are necessary; with the same fitting, different candle-power lamps, graded according to the importance of the streets, can be employed, lamps that fail can be renewed at any time without trouble, the candle-power of the lamp does not appreciably diminish with age, and last, but not least, the average life of the lamps is a revelation. In the author's own experience, some 18 months has given an average life of very nearly 1,100 hours, individual lamps lasting 6,750, 5,450 and 5,044 hours on a circuit at 230 volts where a large and fluctuating power demand does not make for a particularly steady volt chart, however admirable may be the intentions of the switchboard men.

The discussion was opened by Mr. S. E. Fedden (Sheffield), who remarked on the effect of the new lamps in deferring the necessity for plant extensions, an effect which had not been realised. He did not quite know the cost of making these lamps, although he had heard 7d. mentioned, which appeared to leave a large margin for profit; the retailers were also obtaining a good commission, and the only one not making money was the central-station engineer. As showing the effect of the more economical lamps, he mentioned that the Sheffield lighting revenue was down £4,000 this year; his own department had carried out replacements by 5,000 200-volt, 10,000 100-volt, and some thousands of lower voltage metal-filament lamps, and it was probable that the number of new lamps in use in Sheffield was quite double this amount. In one Sheffield club the lighting bill was 64 per cent. less since the new lamps were introduced; and he considered that three new consumers were required to balance one carbon-lamp consumer who changed over. The new lamp had, however, deterred many people from going back to gas. He hoped, in one way, that the price would not fall quickly, as his department sold lamps. He could not agree with the author's suggestion that most municipal bodies would be satisfied to carry out wiring through contractors; in Sheffield, where they had a wiring department, they set the standard of work, and it was much higher than formerly. Of his 8,000 orders last year, quite one half were little orders carried out mostly at night, a class of work which it would not pay the small contractor to undertake. He cautioned members against buying heating plant to let out on hire, on account of the rapidity with which it became obsolete; he considered it only reasonable that his department should have as much control of its affairs as the gas company had of its business.

Councillor Dykes (Beckenham) said his Council did a large amount of free wiring; about half the consumers were so wired. With the carbon lamp the energy consumption averaged 15 units per lamp per annum, and the net revenue 6s. 6d., or, including wiring charges, &c, 8s. per lamp. Since changing over to the new lamps the illumination had been increased 50 per cent., the energy used fell to 9·8 units, the net revenue to 4s. and the revenue, including wiring charges, to 6s. 4d. per lamp, although the rentals were raised. He had found that gas consumers in Beckenham were paying from 12s. to £1 per burner per annum, with gas at 2s. 6d. per thousand feet; from a comparison based on actual figures obtained, it appeared that electricity was very slightly dearer than gas in the district. Taking into account that they were at present supplying consumers at 6s. 4d. per lamp per annum, he thought it might be safely assumed that the extra units which might be used would still make a fixed lamp charge of 10s. per annum a profitable figure, this system being one he advocated for small consumers, as it did away with the necessity for meters. In this connection he pinned his faith on concentric wiring and a transformer for each terrace or block of houses, supplied at, say, 3,000-volt pressure.

Mr. Haydn Harrison said that in a contract which he was carrying out for converting gas standards to electric lighting, the services cost £2 10s. per post, while the replacement of the gas by

an electrical fitting only cost £1; he found that many authorities did not yet appreciate the possibilities of the new lamp for street lighting. He favoured a series system, grouping the lamps on, say, 100 volts, as being much cheaper and more efficient than the present system.

Mr. H. Collings Bishop (Newport) said they had to thank the metal lamp for the present position of street lighting; he had Osram lamps which had lasted 2,800 hours, and found alternating circuits and high voltage lamps to give the better results. During the past year some 400 of their 1,500 consumers had taken up the new lamp, new consumers, however, were coming on, and this practically kept the revenue stationary. He had some 400 to 500 arc lamps on hire, and found this business very satisfactory.

Councillor Dudley Stuart (Wimbledon) gave some particulars of the Wimbledon street lighting since the adoption of metallic-filament lamps, which showed that many lamps burned satisfactorily for 3,000 hours, and that a 95 per cent. better candle-power was now obtained, as compared with the carbon-filament days, and this with a decreased energy consumption.

Mr. F. Sells did not agree as to the happy position of the manufacturer of the new lamps, nor as to the cost suggested by Mr. Fedden. He was not sure that the decreased plant requirement of central stations was a drawback to the manufacturer, taking into account the poor prices offered for plant now. He was credibly informed that although the makers tried to shorten the life of the new lamp by giving a better efficiency, they could not do it.

Alderman Smith (Liverpool) took up the cudgels on behalf of the ratepayer, who expects a contribution to the rates; Councillor Crowther (Sheffield) replied, advocating better service rather than rate aiding, and this side issue having been settled, Mr. Hoadley replied briefly to the only controversial point raised, *i.e.*, the question of wiring, and submitted that it would not harm the supply authority if the contractor made the initial wiring installation.

Metallic-Filament Lamps.

The contribution by Mr. E. E. Hoadley shows a close and reasoned study of a subject which has, perhaps, occupied the attention of supply managers more than any other question between themselves and their consumers of recent years, excepting, perhaps, only the theory of tariffs and charging with which it is intimately related; he may also, perhaps, be congratulated upon his courage in holding up a deaths-head for the edification of any thoughtless feasters, who displayed an unseemly desire to forget their troubles in the giddy pastime of conventing.

To the manufacturer of heavy plant the new lamp certainly brings little at present, and if the cable maker is to reap the greatest benefit from new work, he should devote himself to the cheapening of cable networks and service connections, and so help the engineer with the immediately important problem of serving dwellings which may not yield more than 30s. per annum for a 15 to 20 ft. frontage. The maker of meters has so far perfected and cheapened his productions under the stress of competition, that to urge him further were almost an insult, but his success in meeting the demand for very substantial and reliable instruments for small loads will do much for the supply industry at the present juncture, and help to save us from contract tariffs and restrictive devices with which it would be a pity to encumber the supply of electricity to very small consumers, if by any means avoidable.

With regard to internal fittings, simple and efficient glassware is likely to be called for rather than metal work, and it behoves British glass makers to give every attention to the requirements of the electrical trade in connection with the new lamp, or much valuable work may be lost to the enterprising Continental glass makers.

The question of the price of lamps raised by the author is not likely to pass unanswered by manufacturers; apart from the operation of the natural law, which does not tend to let prices fall whilst lamp works are unable to cope with orders, it must be borne in mind that many of the later competitors in this field have by no means fully perfected their productions, and are at present booking orders rather than securing customers!

With the difficulty of the station engineer, set forth with so much feeling by the author, one can have nothing but sympathy. The A.C. man is being rapidly denuded of his revenue, and the D.C. supplier abused, because it is less easy to treat him in the same fashion, but the only sound course of action appears to be to devote all the available energy to getting new business by means of the improved lamps, and by freely making known to every one the advantages of the change; undoubtedly legitimate though it may be to induce consumers to use as much light as possible, it is neither wise or desirable for a supply manager to dwell exclusively upon the superior lighting to be obtained by his present consumer, whilst putting forward only the greatly decreased cost when attempting to convert a user of gas.

The engineer is looked upon by the bulk of the consumers as their adviser, and their confidence is certainly of sufficient value to his undertaking to be guarded with care.

The residential towns which are feeling the reduction in output so severely, have certain compensations. Mains extensions can frequently be carried out in a more simple and inexpensive manner than is possible in large industrial centres, and the residents in many cases are in a position to listen to the canvasser who suggests that they should spend some of their saving on lighting on a supply for heating and cooking.

Although the prices of warming stoves and utensils for odd cooking operations have fallen greatly during recent years, their sale cannot be looked upon as much more than a practical lesson in the possibilities of the electric supply; before any considerable and steady heating load is obtainable, it will be necessary for the makers to put forward a comprehensive heating and cooking system which will be useable by the domestic of *unaverage* intelligence, and provide those supplies of hot water, local warmth and comfort, and drying facilities which are now provided by the kitchen range as a sort of by-product of the household cooking; given such an appliance, hiring arrangements should offer no great difficulty.

Cheaper wiring must be close at hand, in view of the attention which is being devoted to it, but those who hold the most divergent views on this subject appear to be seldom able to submit costs of work actually done, and would presumably be rather surprised at the comparatively small money saving to be effected by some of the newer methods; in any case, the difference seems likely to be but a small percentage of the annual bill for current consumed, and an almost infinitesimal portion of the cost or value of the premises fitted.

The author's remarks on street lighting can be freely endorsed; at the average ruling prices of gas, electricity consumed in metal-filaments admittedly provides a cheaper and better light, and probably in the future the engineer's energies will be more occupied in combating vested interests than in trying to prove that he has something better to offer. If, however, arc lamps are to be replaced by incandescents, it would seem better engineering to distribute them on the usual short standards, and obtain that better diffusion which has always been the gas engineer's advantage.

In asking for the removal of restrictions and increase of powers, the author voices the wish of every supply manager who is interested in the future of the industry; a word of caution only with regard to how the powers are used. The engineer has little to gain by himself becoming a direct trader with his consumers, and may easily fall in their estimation from that neutral position which allows them to look to him for guidance in their use of the supply, which, however much they appreciate it, they seldom have the opportunity or desire to understand.

European Industries.—Mr. George Westinghouse recently returned from Europe after a trip that lasted more than three months. Regarding conditions in the electrical and engineering trades in Europe, says the *Electrical World*, N.Y., he stated that there had been a notable improvement within 60 days in Germany, France, Belgium, Italy, Austria and Great Britain, as well as a fair degree of improvement in most of the markets to which those countries export electrical engineering products. Engineers in charge of very large hydro-electric undertakings and the electrification of steam railroads told him that work in progress would require more than 125,000,000 lb. of copper within a twelve-month. One concern in Cologne would work up 15,000 tons of American copper this year in ocean cables. Italy and Switzerland were doing a great deal of work in hydro-electric power plants for industrial purposes and in the electrification of steam railways. A dozen nations in Europe that, until lately, were large importers of coal, were carrying out hydro-electric plants that would reduce their imports of coal for steam power by at least 75 per cent.

ECONOMICAL LIGHTING.

By W. H. F. MURDOCH, B.Sc.

In calculating the saving effected by exchanging one type of lamp for another in any building, the usual process consists in making some such calculation as the following:—If n is the number of lamps, each taking W watts and running for A hours per annum, at p pence per unit, then the cost of energy will be—

$$\frac{n\,\mathrm{W}\,\mathrm{A}\,p}{240\times 1{,}000}\text{ pounds.}$$

And, again, if the lamps cost s shillings each, and have a life L, the cost of replacements will be—

$$\frac{n\,s\,\mathrm{A}}{20\,\mathrm{L}}\text{ pounds.}$$

The total cost, therefore, is—

$$\frac{n\,\mathrm{W}\,\mathrm{A}\,p}{240{,}000}+\frac{n\,s\,\mathrm{A}}{20\,\mathrm{L}}.$$

Now, if these lamps were replaced by N others, taking W watts, having a life l, and costing S shillings each, the saving would be given by—

$$\mathrm{E}=\frac{\mathrm{A}\,p}{1{,}000}\left(\frac{n\,\mathrm{W}-\mathrm{N}\,w}{240}\right)-\mathrm{A}\left(\frac{\mathrm{N}\,\mathrm{S}}{20\,l}-\frac{n\,s}{20\,\mathrm{L}}\right)\text{ pounds,}$$

and no saving would be effected if—

$$p=\frac{\frac{\mathrm{N}\,\mathrm{S}}{20\,l}-\frac{n\,s}{20\,\mathrm{L}}}{n\,\mathrm{W}-\mathrm{N}\,w}\times 12{,}000.$$

Generally, therefore, the saving effected is represented by a straight line, or

$$\mathrm{E}=p\,k-k'.$$

If, for instance, 35 50-c.p. ordinary incandescent lamps were replaced by 70 30-c.p. metallic-filament lamps, one finds—

$$\mathrm{E}=17{\cdot}75\,p-9$$

as equation for a 1,000-hour year, taking list prices for lamps, and assuming the life of carbon lamps 1,000 and other 800 hours. We see also it would pay to make the exchanges until the limiting price per unit of about ½d. was touched. From the same equation it is easy to calculate the limiting candle-power for such an exchange. The above then is the usual method adopted, and one notices that in a large building where there are numbers of different lamps, a similar equation still holds good, viz.:—

$$\mathrm{E}=p\,(k_1+k_2+\&\mathrm{c.})-(k_1'+k_2'+\&\mathrm{c.}),$$

or

$$\mathrm{E}=p\,\Sigma\,k-\Sigma\,k'.$$

Now, we see the limiting value for p, or p_0, is—

$$p_0=\Sigma\,k'/\Sigma\,k\,;$$

and we might write—

$$\mathrm{E}=(p-p_0)\,\Sigma\,k.$$

In this expression we have the units saved multiplied by the price per unit reduced by the limiting value given above. If p_0 was known this would enable one conveniently to calculate the saving without referring to the life and cost of the lamps. Noticing that if—

$$\mathrm{E}=p\,\Sigma\,k\,(1-p_0/p),$$

if an error is made in estimating p_0, it only affects the result to the extent $\delta\,p_0/(p-p_0)$. For instance, if $p=4$d. and $p_0=\frac{1}{2}$d. and we write $\delta\,p_0=\frac{1}{2}$, making a 50 per cent. error in our estimation, the value of $(1-p_0/p)$ is only affected by 14 per cent., and if p was 6d., it would affect the result by 9 per cent. Now, by writing the equation, say—

$$\mathrm{E}=(p-\tfrac{3}{4})\,\Sigma\,k,$$

we shall probably be correct to within a few per cent., and it enables one to rapidly estimate the saving for any building in which various numbers of different lamps are installed. Further, owing to the uncertainty regarding the life of lamps and the variation of wattage with time, such a method of calculation is probably as nearly correct as a much more laborious method.

The equations above deal with the usual case where the lamp using less electrical energy costs more than the lamp which it replaces. If there is a saving in the lamp, then—

$$\mathrm{E}=p\,\Sigma\,k+\Sigma\,k',$$

viz., another straight line.

By taking the ratios of these quantities and expanding by the Binomial Theorem it is easy to compare the savings effected in different cases.

It is interesting to note how dear coal sends up the demand for high-economy lamps, and why it is a dead loss to use certain types of lamps, even though these were given away free of charge. One can also see whether or not it is "worth while" to replace lamps burning only for a short time, by more economical lamps.

From the above equations we notice that the saving is greater, the greater the difference between n W and N w. If we assume 1 watt per candle to be the limit likely to be reached, it is clear that no great saving is made in using fewer high candle-power lamps. There is a direct saving in replacements, since a higher-candle-power lamp costs generally less than its equivalent in lower candle-power, but we see that this can only affect the annual saving slightly. In wiring the building also, there is the advantage of fewer points. It seems, therefore, unlikely that high-candle-power incandescent lamps will be largely used for interior illumination, so long as the cost of electrical energy remains as at present. It is interesting, however, to speculate as to what would happen if the price per unit was sufficiently reduced to make it worth one's while to use high-candle-power incandescents.

From a consideration of the above expressions, we see that for some time to come it is unlikely that high-candle-power incandescent lamps will be in much demand.

SOME NOTES ON FRICTION IN WATER PIPES.

By FLAMBARD.

To those engaged on hydraulic work it is very apparent that engineers have different ideas as to the amount of friction head due to the flow of water in pipe lines. It is not safe to assume that the pipes are clean, new and smooth; corrosion, due to chemical action, most commonly to the combination of oxygen with iron, will occur sooner or later, not only increasing the frictional coefficient by reason of the resultant rougher surface, but also reducing the effective diameter of the pipe because of the nodules formed internally, thus further increasing the friction head. The increment of friction loss due to the roughening of the internal surface may be as much as 100 per cent., as will be seen from the results of Darcy's experiments, considered later. Special allowances must be made for special cases, as when pumping water from Cornish tin mines, containing a high percentage of ochre, or unwatering coal pits, the water in which is often heavily acidulated. In such circumstances, where the chemical action is immediate and severe, it is best when figuring the pipe line not merely to allow for rough pipes, but to calculate the friction as for the next smaller internal diameter to that actually installed, thus anticipating the reduction in bore which will occur in practice. In any case, it is wisest to obtain an analysis of the water, so that its action upon the pipes may be foretold with the greatest accuracy possible. Scrapers have been devised for cleaning pipe lines, notably that of Appold, which was actuated by the pressure of the water, but they cannot be regarded as generally practicable. All iron and steel pipes for water should be treated with Angus Smith's composition before rusting sets in, and at the proper heat, the temperature of the pipe being about 310° F. and that of the bath of oil and pitch at least 210° F. This is a most excellent preservative, and also renders the pipe more smooth, while the process is quite cheap, costing about 5s. per ton for ordinary sizes, and pays for itself owing to the smaller effort necessary to push the same quantity of water through the pipe. It is an interest-

ing fact that the reinforced concrete pipes now frequently installed in connection with sewage disposal works, &c., are as smooth as, if not smoother than, varnished cast-iron. The most valuable experiments on the friction of water in pipe lines are those of Darcy, who crystallised his results into the following formula:—

$$h = z\left(1 + \frac{1}{12\,d}\right) \times \frac{4\,l}{d} \times \frac{v^2}{2\,g},$$

where—

h = head lost in friction in feet;
d = internal diameter of pipe in feet;
v = velocity of the water in feet per sec.;
l = length of pipe in feet;
g = acceleration due to gravity, 32·2 ft. per sec. per sec.

The experimentally determined coefficient z

= ·005 for new cast-iron pipes,
= ·01 for incrusted cast-iron pipes.

Considering the case of 500 gallons of ordinary water flowing per minute in a 7-in. pipe 100 yards long, with a velocity of 5 ft. per sec., with the above formula:—

$$h = \cdot005\left(1 + \frac{1}{7}\right) \times \frac{1{,}200}{\cdot583} \times \frac{25}{64\cdot4}$$

= 4·6 ft. for a clean pipe, and obviously, 9·2 ft. for a rough one.

The best and most convenient formula giving accurate all-round results is that of Box, who makes

$$h = \frac{G^2 \times l}{(3\,d)^5},$$

where h = head lost in friction in feet;
G = gallons of water flowing per minute;
l = length of pipe in yards;
d = internal diameter of pipe in inches.

Working the same example as before, we get—

$$h = \frac{500^2 \times 100}{(21)^5} = 6\cdot1 \text{ ft.},$$

a good mean value between those already obtained on Darcy's authority. Box states that his formula is intended for clean cast-iron pipes, but there is no doubt that, save where the circumstances are very exceptional, the results obtained from it are well on the safe side, and its use can be recommended from actual experience.

CONTRACTORS AND THE NEW HOME OFFICE RULES.

[COMMUNICATED.]

On July 1st the use of electricity in factories and workshops became subject to the Rules and Regulations drawn up by His Majesty's Home Office. These must be complied with by the electrical contractor, and it is well for him to note that compliance can be enforced by law. Hitherto the new Rules have not been seriously regarded by the average contractor. He has, perhaps, glanced through them when seen in one or other of the electrical journals, but it is doubtful if, offhand, he could mention half-a-dozen of the new conditions. The makers of electrical machinery and accessories have, on their part, been experimenting with and developing new types of appliances, in order to meet the new circumstances, but the contractor has not troubled to make himself familiar with the new requirements. There are also certain eventualities which have not received due attention—as, for instance, the possibility of a factory owner being served with an injunction against the use of electricity in any particular premises, obtained at the instance of some third party.

Those engineers who are acquainted with the circumstances which led up to the framing of the Home Office Rules, are aware that prior to 1907 the Home Office had been considering means whereby accidents caused by electricity or by electrically-driven machinery might be prevented, and early in that year they issued the draft Regulations governing the generation, transformation, distribution and use of electricity in premises under the Factory and Workshops Act. At that time all public supply undertakings were subject to the Rules of the Board of Trade, but with the exception of collieries, no privately owned plant was governed by any regulations whatever of a technical character, except those issued by the Fire Office in which the premises were insured. Apart from fire and common law risks, the interior arrangements might be carried out as the owner or contractor pleased. It was felt that this was a state of things which could no longer be tolerated, and that in the interests of all parties concerned, it was desirable that a set of regulations should be drawn up, which after mature consideration, should become law.

The form of the draft resolutions was severely criticised, and objections were received by the Home Office from some 200 or more objectors representing a number of important firms, and many public bodies. Consequently an inquiry was held, in which the draft regulations were very considerably modified. The points to which the greatest attention was given, were the overlapping in many instances by the new Regulations of the older Board of Trade requirements; the advisability of providing for arbitration in cases where a dispute arose between a Home Office inspector and the occupier or owner of any premises; and the application of the Regulations to existing plant.

The first objection was obviously sound, and in the case of premises such as electricity supply stations, it was clear that the best course to adopt to secure uniformity would be for the Board of Trade Rules to be withdrawn. This was decided upon, and it was announced that in all instances where the two sets of regulations overlapped, the Board of Trade Rules would not be enforced. With regard to this promise, it is curious to note that although some 15 months have elapsed, and the Home Office Regulations have become law, no public notice has as yet been issued by the Board of Trade confirming this declaration.

Ably drawn as the Regulations are, it is not certain from a legal point of view that they are so framed as to prevent annoyance to the occupiers of premises who may be doing their utmost to carry out the requirements, and to make their premises as safe as possible from an electrical point of view. The occupier may have to deal with a factory inspector possessing little or no technical knowledge. Provision is made in the new enactments whereby apparatus may be exempt from certain of the Rules, provided it has been made perfectly safe in some other way. At the same time, if the inspector does not agree with the method which has been adopted, the occupier may be prosecuted. In such an event the case would be heard before a bench of magistrates, who might quite easily, being themselves non-technical men, lean towards the views of the inspector, and fall back on the fact that a Regulation had apparently been broken, and convict on that ground.

A further disquieting feature of the rules is that although an occupier may arrange his electrical plant in a manner which, in his opinion, is perfectly safe, and of which the inspector may not disapprove, indeed may even approve, he may yet be prosecuted by any member of the public whatsoever; thus subjecting him to annoyance, with possibly vexatious results. In face of this it would appear most desirable that some provision should be made for arbitration, and Mr. Swinburne, in his report, made a recommendation to the effect that, before prosecuting under certain sections of the Act on the ground of non-compliance with the requirements, the Home Office should serve a notice and not take any further proceedings until after the lapse of 30 days, during which time the occupier might make representations to the Home Office describing and defending the means he had adopted to ensure safety. This would admit of a special inspection of these by the electrical inspector of the Home Office, or his representatives, before any further action was taken. Mr. Swinburne also recommended that "nothing in these Regulations shall render any occupier or agents liable for non-compliance unless the Home Office says there has been non-compliance."

It is regrettable that these recommendations have not

been adopted by the Home Office. As they now stand, any factory occupier is liable to meet with an unreasonable interpretation of the Home Office Rules by the local inspector; to suffer prosecution at the instance of any person, even a discharged employé; and in the event of an accident occurring, to the infliction of severe damages if the letter rather than the spirit of the law has not been complied with. And there is no doubt that the contractor who was responsible for the carrying out of the work could be proceeded against in turn by the occupier, or would be coupled with him in any action for damages.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Engineer's Department v. Accountant's Department.

In reply to "Quid Nunc" in yours of June 25th, I am afraid we must agree to disagree. I cannot see any necessity to make a prior entry at all. If, as I presume, the creditors' ledger and the cash-book are both kept by the accountant, there is no need for an entry into the ledger until the account is paid, upon which an entry will be made in the Cr. of the cash-book, and posted to the debit of the creditor's account in the ordinary way. If the two books are kept by separate departments, the misunderstandings between them will probably continue until some more up-to-date system is adopted.

Your correspondent cannot get over his idea that I am jealous of the works staff. I have already assured him that this is not so, and as I am not a municipal man, his references to the Municipal Treasurers and Accountants do not affect me in the least. At the same time, I cannot see what my aspirations—whatever they may be they are not to become a municipal financial officer—have got to do with a dispute as to the correct method of book-keeping.

Accountant.

Electrical Exporting.

Reading your article of June 18th, it occurred to me that while I was in Mauritius in 1905-6-7, an English firm obtained a contract for machinery, &c., for a power house for the supply of Port Louis with electric light. Mauritius is plentifully supplied with water power, and has developed rapidly as a cheap-power colony. The demand for electrical goods is fairly heavy, and yet there is not, to the best of my belief, one English firm with a man on the spot, the whole of the supply being in the hands of French and German firms. Alternating current, high-tension single and polyphase, is in use, with transformers reducing to mostly 235 volts. As the price of coal is from Rs. 35 to Rs. 45 per ton, and hydro-electric power is supplied at about 5 cents per unit (Rupee 1s. 4d., cent = $\frac{1}{100}$ of Rupee), it will be seen that electricity is much the cheaper power. The voltages on the transmission lines vary, 20,000, 6,600 and 2,000 being most general. I personally inspected the various supply stations, and was rather surprised to note the lack of English goods in general use.

Jas. Richards.

E.M.F. in a Dead Underground Cable.

I have read the various letters relating to the above, and, from the explanations put forward, I do not think the actual condition of affairs has been made sufficiently clear. As the writer of the original article, I beg to take the liberty of again stating the principal points of the case.

The E.H.T. feeder cables were being laid from the site of a sub-station where a supply was not then available. They had been laid well over two miles towards the generating station, and there was—at the time when the incident referred to occurred—about another mile of cables to lay to the station.

Now the points I wish to emphasise are: that the cable had never been made alive, nor was it near a source of supply; and that in this case it was not the conductors of the cable the shock was received from, but the lead sheathing, which, being laid solid, was unintentionally insulated from earth. It was, therefore, not a question of surface leakage.

It should also be noted that the jointer was working on the lead of the cable, and thus earthing it through his body for quite 20 minutes before the lightning discharge took place, and immediately the discharge occurred he received a severe shock off the lead of the cable to earth.

"Ajax" in his letter states that "the phenomenon was clearly due to a discharge of lightning causing an induced static charge in the cable, which was discharged to earth when the jointer touched the cable."

Might I suggest that the phenomenon was rather that of "conduction"—that is to say, during the period the jointer was working on the lead sheathing of the cable it was being charged to the same potential as earth, right up to the time the discharge occurred. Then, immediately the lightning discharge took place, earth assumed normal potential and simultaneously the lead sheathing, the discharge between the lead and earth passing through the jointer's body, and producing the shock he received.

Enquirer.

Earth Indicating Device.

I shall be glad to learn through your columns if there is on the market an instrument or device for indicating insulation defects on private installations fed from a public supply system. What is wanted is an instrument somewhat similar to the centre-zero voltmeter or to the two-lamp indicating device commonly used on private two-wire installations. The difficulty I have met with is that in putting a continuously indicating instrument on one of our installations fed from a public supply, if our neighbour gets a fault on his installation this fault is indicated on the instrument in our works, because, of course, both are supplied from the same feeder.

W. H. B.

Chichester Electrified.

I do not envy the engineer-in-charge of the above scheme. His supply is dependent upon oil engines, *one* feeder cable and *one* balancer. The poor balancer will be running day and night, year in and year out, and should it dare to fail in any way, down goes the supply! What was the matter with putting two dynamos of 250 volts each in tandem on each oil engine and being independent of balancers? I gather, however, from the tremendous network system, that there is not very much power to be supplied, and I should have thought that a simple two-wire system would have been the thing for Chichester, as a good two-wire scheme is far safer and better than a three-wire scheme, where there is a grave danger of losing the balance and blowing consumers' lamps to atoms. Trusting that Chichester may soon obtain a spare balancer and another feeder—

Not too Cheap.

Municipal Trading and the Electric Lighting Acts (Amendment) Bill.

I fear that "Borough Electrical Engineer" in his letter on the above subject, in your issue of June 25th, has scarcely succeeded in strengthening his position. He refers to the House of Lords' amendment as "an attack upon municipal trading by which it was hoped to cripple municipal electricity schemes," but it would surely be more correctly described as a defence against encroachment by municipalities upon the rights of private traders, and one moment's consideration would show that, far from wishing to cripple municipal electricity schemes, it is all to the advantage of electrical contractors that these should prosper, so long as they are confined to their legitimate sphere, namely, the supply of current.

I must confess that I am at a loss to understand his application of the term "abusive" to my letter, seeing that in it there is not one word of abuse, either direct or implied.

He further charges me with being unable to read with understanding, and I must admit my inability to differentiate between his original statement that the wiring contractor's

grievance "is, at the outside, a matter of 4s. 2d. per annum," and mine that "the money value of the damage done to the contractor is put by your correspondent at 4s. 2d. each." "Borough Electrical Engineer," however, takes great exception to the latter statement, and now tells us that he "did not say or think that a contractor's *total* loss is equal to his rate contribution" (*i.e.*, the 4s. 2d. per annum above referred to), so that one is led to the conclusion that the balance of the contractor's loss beyond the 4s. 2d. is *not* a grievance. Perhaps "Borough Electrical Engineer" will tell us what it is?

I am told that my second paragraph is based on several unwarranted assumptions. Looking through the same, I find that the total number of assumptions is exactly two. The first is the likelihood of the loss on a municipal wiring department being equal to a penny rate. This is taken from his original article, his words being "it cannot very well cost more than a 1d. rate," and he feelingly adds "if it did, the general body of ratepayers would be up in arms." He now admits the statement to be both unwarranted and absurd. The second assumption is that the average loss made by a municipal wiring department does not exceed 10 per cent. This he characterises as "equally absurd." Well, I hesitated to put it at a higher figure out of deference (I feel unappreciated) to "Borough Electrical Engineer's" feelings, but I will gladly accept, without question, his own estimate of the average percentage of loss made in the case of a municipal wiring department costing the ratepayers a 1d. rate. If he puts it at a lower figure than mine, he strengthens my argument, as this would mean a larger amount of work taken away from contractors. If, on the other hand, he puts it at a higher figure than 10 per cent., he will scarcely advance the cause of municipal wiring, at any rate so far as the ratepayers are concerned.

The only point in the original article with which I attempted to deal in my letter was the damage done to contractors by the institution of municipal wiring departments, and "Borough Electrical Engineer" now admits—

1. That the loss to the contractor is greater than that mentioned in his article.

2. That one of his assumptions is unwarranted and absurd.

3. That his contention was something quite different from that which he stated so clearly and explicitly in his article. That is practically equivalent to withdrawal, and I am content to so regard it.

Of the extraordinary attack upon electrical contractors generally with which his letter concludes, probably the less said the better. It is quite clear that in the heat of argument the writer has let his pen get the better of his judgment, and, doubtless, had he seen his letter in cold print before the same was published, it would never have appeared in its present form. Possibly the best reply is the fact that the great London supply companies, although possessing full power to carry out wiring, should they so wish, have not found it either necessary or desirable to do so. Surely no better argument than this can be needed against the establishment of municipal wiring departments.

Contractor.

Electric Power at Messrs. Cassell & Co.'s Printing Works.

I read with interest the article on this subject in your issue of June 25th, and would like to call your attention to fig. 9, showing toggle press in black shop.

In the context this is described as a self-contained equipment of a toggle press in black shop driven by a spur-geared motor mounted on the top of the machine. This toggle press—if it is such—is the most peculiar thing of its kind I have ever seen, and I cannot help thinking that the author has incorrectly described this, as it is apparently a hydraulic press with its own pump electrically driven.

I shall be interested to hear whether Mr. Broadbent claims credit for the drive shown in fig. 2, which is a Victoria platen, driven by a belted motor with a jockey pulley. I might mention that these machines, with their drives, are imported from Germany, exactly as shown in the photograph.

Printers' Engineer.

OUR LEGAL QUERY COLUMN.

[Questions addressed to this column should be written on one side of the paper only.]

"West Country" writes:—"Would you kindly answer me the following inquiry viz.:—A private company have been formed here for the purpose of generating and selling electricity. The same company also take on wiring and sell fittings. If a contractor steps in and carries through the wiring of any premises in their district in a satisfactory manner, and conforms to their rules, can they refuse to connect him up to their mains? I do not know whether a provisional order was got out, and as far as I can understand there has been no B. of T. inspection."

*** The answer to this query depends entirely upon whether there has or has not been a provisional order obtained by the company. If they have no provisional order, they are under no obligation to supply electricity to anyone. If, on the other hand, they have a provisional order, each consumer in the district is entitled to be supplied on the same terms upon which a supply is granted to any other consumer. "West Country" had better make inquiry with this object.

THE BRUSSELS EXHIBITION OF 1910.

From the different communications that have lately reached us, we gather that the new Exhibition Branch of the Board of Trade is doing its utmost to ensure that British exhibitors shall make a display worthy of British manufacturing and industry at the Brussels Exhibition of 1910 (May to October).

Exhibitors are no longer to be dependent on a voluntary committee; or left to install their goods as best they can; or exposed to the risk of being obscurely placed; or required to defray the cost of a general scheme of decoration; or engaged in a speculation the cost of which they cannot ascertain beforehand. The new Department is acting in personal touch with them, and is taking responsibility for these matters.

French and German exhibitors have long been assisted in systematic ways. But the new organisation undertakes to do more than is done for the exhibitors of any other country, and Mr. U. F. Wintour, the British Commissioner General, is approaching all the staple trades of the country with a view to secure at once that arrangements shall be made for an exhibit showing the scope and real importance of British manufactures.

It is stated that perhaps the most prominent position in all the Exhibition has been secured for the general section; visitors must pass through the British galleries to reach those of Germany, the United States, France, Italy and other nations. In the Machinery Hall the portion allotted to Great Britain occupies the centre; and the total space, 203,410 sq. ft., compares favourably with what has been granted by the Belgian Commissioners to our rivals. The Royal Commission, which is presided over by the Prince of Wales, has its offices in Queen Anne's Chambers, Westminster. It is constituted wholly of well-known business men; and the occasion being unique, His Royal Highness is giving active help to the Commissioners.

A departmental inquiry, concluded two years ago, was the means of opening this fresh chapter in the history of International exhibitions. It was presided over by Sir Alfred Bateman. Taking the opinion of a large number of important manufacturers, the Committee found a strong and growing prejudice against exhibitions on the old lines, and came to the conclusion that it was largely justified. But, as it would evidently be ruinous for Great Britain to abstain alone from a form of advertisement which was already well established, they recommended effective means of meeting the grievances of British exhibitors.

The Exhibitions Department of the Board of Trade, which has been placed under the direction of Mr. Wintour, is the chief outcome. Instead of every exhibition being treated as a new problem of organisation—a problem more or less hastily and badly solved—this Department exists as a permanent machinery for the care of British interests in such matters.

To enumerate the facilities now first offered to exhibitors is to realise that a principal aim of the Exhibitions Department has been to simplify the business of exhibiting. These facilities are such that an exhibitor may know beforehand to a penny what his venture will cost him.

Except in the case of machinery, the only charge made within the Exhibition itself is a low one for space; and tenders will be obtained from Belgian contractors for the installation of machinery. This charge for space covers the provision of show-cases, the cost of the general decorative scheme, the handling of exhibitors' goods, the publication of a catalogue in French and English, and some other benefits to be noted presently. "Handling" means that officials of the Commission will take delivery of packages at the Exhibition entrance; unload and place them on the space allotted; take away, store and return the packing cases; re-load at the close of the Exhibition. Further, the Commissioners will provide free of cost, as far as possible, an adequate supply of unskilled labour to assist exhibitors with the installation of their goods.

Machinery will involve, of course, the additional cost of foundations and shafting; that of main switches, safety fuses and meters for electricity, stop-valves for steam, and valves and meters

water; and that of the power used for driving. Crane power is free of charge.

Samples of show-cases may be seen at the offices of the Royal Commission, 30, Broadway, Westminster, where particulars may also be obtained of the tariff of charges for space.

For motive power the charges are low. The Royal Commission will defray half the charges made for it by the Belgian Administration, on all machinery driven to illustrate processes of manufacture. Thus exhibitors will pay:—For steam (133 lb. pressure), ½ centime per kilogramme; for gas, 1s. 3d. per 1,000 ft.; electricity (2 × 220 volts continuous), 1½d. per KW.-hour. Water will be supplied free for pumps or condensers.

Not only will there be crane-power, but the laying of foundations by Belgian contractors will be superintended by a competent engineer employed by the Royal Commission. It is claimed that, with the above particulars, the railway and shipping freights, and the contractors' tender, an exhibitor of machinery can make his calculations with a degree of confidence not hitherto possible.

The special catalogue for the British section, published in English and French, will give free insertions, and a suite of rooms will be provided for exhibitors' agents.

The Belgian State Railways, charging full rates on the outward journey, will return exhibits to their termini free of charge. The British railway companies will make a reduction of 50 per cent. on returned exhibits not sold, and travelling by the same route to the station from which they were sent out. Twelve shipping companies have also agreed to this 50 per cent. reduction.

The chairman of the Royal Commission is Lord Lytton, and the vice-chairman Sir Swire Smith. The interests of machinery and electricity are represented among the Commissioners, who include:—For machinery: Mr. W. J. Crossley, M.P., chairman of Crossley Bros.; Mr. John McLaren (J. and H. McLaren), President of the Agricultural Engineers' Association; Sir William Mather; and Mr. T. Hurry Riches, President of the Institution of Mechanical Engineers. For electricity: Dr. R. Tetley Glazebrook, F.R.S., director of the National Physical Laboratory and ex-President of the Institution of Electrical Engineers; Mr. Guglielmo Marconi (managing director, Marconi International Marine Communication Co.).

The Machinery and Electricity Committee has the following co-opted members of the Commission:—Mr. E. B. Ellington (London Hydraulic Power Co.), Mr. W. H. Allen (Allen, Sons & Co., Bedford), Mr. Mark Robinson, Mr. H. F. Donaldson (chief superintendent Ordnance Factory, Woolwich), Mr. J. H. Wicksteed (Joshua Buckton & Sons), Mr. R. H. Fowler (Fowler & Co., Leeds), Mr. W. Duddell, F.R.S., Mr. H. J. Brackenbury (Armstrong, Whitworth & Co.), Mr. J. E. Kingsbury, Mr. W. H. Patchell, Mr. W. M. Mordey, Sir John Gavey, C.B., Col. W. Shanks, V.D., Mr. W. D. Ford-Smith, Mr. Allen Baker, M.P., Mr. Frank E. Musgrave, Mr. Arthur Greenwood, Mr. J. G. Barford, Mr. John Fielding, and Mr. W. Harrison.

We recommend British electrical firms to place themselves in communication with the new Department. We have frequently urged the necessity for Governmental organisation and guidance in this matter of foreign exhibitions, and it is the duty of our manufacturers to support the present effort, if only for the purpose of testing what measure of success they can obtain from efficient representation at a Continental Exhibition in which they have the benefit of this Governmental assistance.

LEGAL.

Electric Co.'s Stamp Duties.

On Monday last the case of The Attorney-General *v.* The Somerset and District Electric Power Co. came before Mr. Justice Ridley in the King's Bench Division on a motion by the plaintiff for leave to issue *scire facias* against a shareholder in the defendant company.

Mr. Finlay, in support of the motion, said that under the old Act the Companies' Clauses Act was commonly incorporated by railway, gas and light companies. One of the Sections of that Act provided that execution might be obtained against a shareholder where stamp duties had been assessed and had not been paid by the company. He asked for an order against a gentleman who was a shareholder and who had been one of the original directors of the company. The gentleman in this case assented to the order asked for, but as he held an official position he desired that his name should not be mentioned. Counsel supported that request, and his Lordship assented to it.

Leave was accordingly given to issue *scire facias* without the name of the person against whom it was to be issued being disclosed.

British Westinghouse Electric and Manufacturing Co., Ltd., *v.* Braulik.

(*Continued from Vol.* 64, *page* 1037.)

Mr. Jas. Swinburne, examined by Mr Walter, said he had read the plaintiffs' specification, No. 18,786 of 1902. It was important in the regulation of electric lamps that the governing of the external conditions of the arc should be independent of the downward feed mechanism. He had tested fig. 1, and found that it worked. He thought there was no difficulty in making a lamp from the description in the plaintiffs' specification. The invention was obviously useful, and was commercially of great value. He did not find that there was any disconformity between the provisional and complete specifications. He had read the list of documents that were set out by the defendant alleging that the invention was not novel, but he did not find the invention therein described. He did find, however, the invention which had been described of the plaintiffs' in defendant's. There was nothing to mark the distance apart of the lower carbons until you got them to a certain point, and it then released the downward feed. The mechanism did nothing but move the lower carbons apart and together.

His Lordship: You say there is no essential difference between the parts?—It was essentially the same mechanism, though, of course, the details were different. In both cases, the escapement was regulated by a shunt magnet which only allowed escapement after a certain amount of movement of the carbons had taken place horizontally.

On the resumption of the case, Mr. Swinburne was cross-examined by Mr. Bousfield, to show that the method of regulating the arc by solenoid control in addition to the gravity feed was not new.

Supposing the arc burnt to a greater length before you got the irreversible feed of the carbon, this gripping movement allows the carbons slowly to approach?—Yes.

And also if for any reason it should want to adjust itself, then this gives power of adjustment?—Yes.

That is precisely what the patentee has tried to introduce in this specification to these inclined carbon lamps?—No; because in the mechanism you have shown, the part which is to adjust the arc, has practically to work a feed mechanism. According to the patent, the adjustment is done by the movement at right angles to the direction of the feed, and it involves, therefore, only moving a very small body.

Counsel then referred the witness to Graham No. 268,218, but the Witness said that the method of attachment was different from the plaintiffs', but was like the defendant's.

Were there not scores of lamps in which the governing armature of the magnet for the striking gear was in equilibrium between the force of the magnet coil and the force of the spring?—Yes.

Witness was referred to the specifications of Serrin, Brush, Crompton, Gramme, Siemens, Joel, Thomson-Houston, Abdanck, Maxim, and Brockie, all before 1882, and he admitted that in all of these there was an armature acted on by an electromagnet in such a way that the armature floated and did not strike.

If it did float it would far more satisfactorily fulfil the purposes described on page 1 about obviating the inconvenience arising from irregularity?—Yes, it would be a better lamp in every way.

Referring to Sheridan's United States patent, the Witness said that there the carbons were allowed to feed by means of cords through drums. The drums were of different sizes in order to compensate for the different rates of feed of the carbons, and there was also an arrangement of series coil and shunt coil arranged differentially. When that was done the core was necessarily a floating core.

The purpose of it was to have this floating in position?—Yes. It was not only to arrange the feed, but also to allow a pull back.

Witness was then cross-examined in detail as to Crosby, and said that long before the date of the plaintiffs' patent, there were plenty of arrangements of the Brockie-Pell type, in which the striking of the arc was effected by mechanism which controlled the main feed.

What I want to put to you is whether it required any invention to apply that to the known type of lamps with inclined carbons and a striking mechanism which operated horizontally on these carbons?—I think it did.

Surely, if you told any workman to control the feed mechanism by the striking mechanism, which would allow the swinging before the feed came on, he would have been able to do it?—If you told the man that he was to make his horizontal movement not only to strike the arc but to regulate the arc, keeping the vertical movement for feed only, then you would have made Bremer's invention?—Witness said he considered the plaintiffs' invention was having axial feeding of the carbons and horizontal striking, plus horizontal adjustment, all worked by one electro-magnet or one mechanism.

All that you find in Graham's specification, if it be allowed that the armature or core of the solenoid is floating?—That is really law. All I can say as an engineer is if you work the model and it floats, it floats. Whether or not you find the idea in the specification, I am not lawyer enough to say.

I suggest to you that, at all events, if the true reading of Graham's specification be that the armature or the core of the solenoid does float . . . . .?—Then it is an anticipation of the unamended claim.

Mr. Swinburne, in re-examination, was taken by Mr. Walter through the various specifications relied upon by the defendant as anticipations. He said that there was nothing in the prior specifications which would have enabled him, as an engineer, to have made the plaintiffs' invention. The prior specifications differed from the plaintiffs' and the defendant's apparatus in that the system by which the carbons were fed was independent from the system that moved the carbons apart. With regard to the practical utility of the lamps relied upon as anticipations, so far as witness knew, none of them had ever seen daylight. In the defendant's lamp he found all the features, that were described in the plaintiffs' specification.

Mr. Dugald Clerk, examined by Mr. Walter, said that he had examined the plaintiffs' specification. The first and main

feature was the combination of a striking mechanism with a horizontal adjustment, and the relation between the horizontal adjustment and the feed. That was, in his opinion, the invention, but there were other important features. It was important that the electrode holders that held the carbon should be firmly clipped at the middle, as shown in the first figure of Bremer's specification. It would be seen from that that the current entered the carbons by means of a metal connection firmly clipped on to them. Then it was important with regard to the downward feed mechanism that it should be so connected that the two carbons fed downwardly simultaneously in separate clutch slides. The third point was that the horizontal feed mechanism, as operated on by the electromagnet by which the arc was sprung and the resistance of the arc reduced, should be by some device operating not far from the lower ends of the carbons. It was important that the feed mechanism should be relieved of every work other than that. In the specifications of Brokie-Pell and Serrin the mechanism had a great deal of work to do. Neither would have acted the same as plaintiff's arrangement. In witness's opinion, there was room for invention between the lamps described in prior specifications and the plaintiff's arrangement. The defendant's lamp had every feature of the plaintiffs' that he had referred to.

MR. JUSTICE JOYCE: They are the same thing, but different.

MR. WALTER: There is a slight difference, but alternative methods of sliding feed were known. To witness: Is the plaintiff's mechanism *per se* new?

WITNESS: New, but perhaps not new *per se*. Continuing, he said that, in Graham's specification, you did not find the floating adjustment. He saw nothing in the prior specification that would suggest the plaintiff's invention.

Cross-examined by MR. BOUSFIELD, WITNESS said that there was nothing omitted from the plaintiff's specification that would prevent a competent workman from making the invention. He did not think that a man instructed as suggested would find it easy to apply the old mechanism to the plaintiff's invention. The principle of having an arc striking device connected with the main feed in such a way that the arc-striking device gave a certain amount of regulation before the main feed was operated on was old and well known before the date of the plaintiff's patent, in vertical operating lamps. Carbons with a swinging adjustment so as to strike the arc were well known.

MR HERBERT EDMUND MOULD, technical engineer of the Union Electric Co., Ltd., who were agents for Korting & Mathiesen, called for the plaintiffs, said that of the flame arc lamps made in this country nearly all had the plaintiffs' invention. In the course of his business he saw the lamps of other makers, and he should say that about 11 or 12 out of 16 were constructed on the principle of the plaintiff's invention. His firm sold lamps manufactured under a licence from the plaintiffs, and under that licence they had sold some 12,000 or 14,000 lamps in this country. They paid a large royalty to the Westinghouse Co. In his opinion the plaintiff's invention was the commercial solution of the flame-arc lamp.

In opening the case for the defence, MR. GRAY said his submission was that the points raised on behalf of the plaintiff company were destructive of each other. First they alleged that the question was one of principle, and then it was said that the real change was certain mechanical details which did not appear on the specification. His contention was that there was no subject matter whatever in the plaintiffs' patent. The expressions that appeared in the specification must be taken as the real subject matter of the patent. Broadly speaking, there were two. They were defined as a horizontal feed and a downward feed. These expressions were illusions and had no real meaning as applied to the lamps. There was neither a horizontal feed nor a downward feed in these lamps. He should call the horizontal feed the "adjustment," and the downward feed merely "the feed." The former merely involved the swinging about of the carbon. In 1882, which was one of the dates more or less in dispute, there were a large number of lamps that had an adjustment of feed. His witnesses would prove that such lamps were practically universal. In the plaintiffs' patent the steps taken were in the same order. First, there was an adjustment of the mechanism, and then there was the adjustment of the feed. Unless the plaintiffs could prove the contrary, he should maintain that that was the invariable practice in all arc lamps in 1882. It was a cardinal principle in arc lamps of that date to have both the operations. It was quite clear that the carbons had to be fed forward to bring the points together, as they burned away. All that the plaintiffs' patentee had done, was to apply these well-known principles to inclined carbons. The patentee had taken the principle of the other arc lamps, and used it in the same way, and for the same purpose, and in his specification did not describe any mechanism which enabled it to be done. All the operations were the same. There was swinging for the purpose of striking the arc, and a feed afterwards. There was nothing left after that for the plaintiffs to do. The system of adjustment and feed were perfectly well known before 1882. His witnesses would prove that the real difficulty was not adjustment at all, but the feed. There were different methods of feed and different results. The method shown by the plaintiffs' specification was absolutely and entirely useless, and the defendant was not using it. He submitted that the patent was hopelessly bad, not only because of lack of subject matter, but also because of want of novelty.

PROF. SILVANUS P. THOMPSON, examined by MR. GRAY, said that in 1882 there was a great deal of activity on arc lamp questions. In 1882 it was perfectly well known that you might have the mechanism in an arc lamp so that the striking mechanism might be brought into action before the feed back applied, or that it might be arranged to be fixed without any return on adjustment, and in the majority of cases they were so designed that approach of the carbon points must occur before the feed back applied. In 1900 practically all the lamps possessed that feature—that was to say, they had the power of return before feed. They were not hard fixed; floating armature was practically the same thing as the power of return. As he understood it, the device described in Bremer's specification of 1902 was that in arc lamps he was proposing to make there would be two movements—a feed movement and a striking movement capable of adjustment, and he specially drew attention to the requirement that the approach during adjustment should occur before feeding began. There was nothing new in that. The only thing that witness found that was new in the specification was in his providing in figs. 2 and 3 a very special and unusual form of electro-magnet. Looking at the specification he did not obtain any useful information for the construction of an arc lamp from those figures. He considered that Graham's American specification practically described what was described in Bremer's specification.

Cross-examined by MR. WALTER: He did not know of a single downwardly pointing inclined carbon lamp, before the date of Bremer's specification, in commercial use in this country.

PROF. JOHN GEORGE CORMACK, examined by MR. GRAY, gave evidence generally corroborating the evidence of the last witness. He said he found in Graham what was described in Bremer's specification. He failed to find any feature or information in Bremer's specification which was new at the date of the specification.

Cross-examined by MR. WALTER: May I take it that until the Bremer patent such a lamp had never been made or sold?—I had not seen any.

WITNESS said that he did not agree with the evidence of Mr. Clark.

MR. BOUSFIELD, in summing up the defendant's case, submitted that there was a complete anticipation of the alleged invention of the plaintiffs in the specifications of Graham and Crosby—Graham's was much nearer to the present case, and was the chief thing he was going to rely upon. He contended that there was nothing in the point put forward by the other side as to making flame-arc lamps successfully. He contended that all that Bremer had done was to apply an old idea to an old form of lamp, and that there was no subject matter.

MR. WALTER, replying on the whole case, submitted that from the evidence it was abundantly clear that until the date of the plaintiffs' patent in 1902, there was never an effective electric arc lamp on the market with downwardly inclined carbons. Neither Prof. Thompson nor Prof. Cormack had ever seen one. This invention was undoubtedly one of great commercial importance, and he asked his Lordship to hold that the patent was a good one, and that the defendants had infringed it.

At the conclusion of the arguments, his LORDSHIP reserved judgment.

UXBRIDGE AND DISTRICT ELECTRIC SUPPLY CO.

MR. JUSTICE NEVILLE, sitting for the disposal of companies winding up business, had before him on Tuesday last a petition by Callender's Cable and Construction Co., Ltd., for the compulsory winding up of the Uxbridge and District Electric Supply Co., Ltd.

MR. PETERSON, K.C., in support of the petition, stated that he represented a creditor for £2,210 7s. 3d. due on a dishonoured bill of exchange. The company, when called upon to pay, said they had no assets with which to meet the debt. The Metropolitan Electric Supply Co. were also creditors, and supported the petition.

MR. SERJEANT said he appeared for creditors for between £40,000 and £50,000, and supported a compulsory winding up.

His LORDSHIP made the usual compulsory order.

PARLIAMENTARY.

Bury and Heywood Tramways Bill.

ON Tuesday, June 22nd, MR. W. CLOUGH, manager of the Bury Tramways, continued his evidence. Replying to MR. HELME, a member of the Committee, witness said that the reason why he thought Bury should provide a through service instead of Heywood, who already were in possession, was that if Heywood gave the service it could only be partial. Through running to be successful must be continuous. If Bury ran right through, it would provide a more convenient and regular service. For an authority in the middle of two districts to have through running, in his opinion, would cause great inconvenience. Of course it would be better to have only two authorities providing a through service. Mr. Clough was in the witness box the whole of the day.

The WITNESS was re-examined on June 23rd by MR. RAM, K.C., for the Bury Corporation. In answer to the CHAIRMAN, MR. CLOUGH said that the cost of working in Heywood was greater than in Bury and Rochdale owing to the steeper gradients. Replying to Counsel, Witness said that in his opinion the through-route fares should be less than the aggregate individual short-distance fares. That was a universal practice with tramway undertakings. The Rochdale and Heywood authorities wanted to keep the same scale of fares

as at present. If, as he had said, they were to charge a lower fare for a though journey, it would mean that Bury would have to bear the loss.

The consideration of the tramway portion of the Bill was adjourned to see whether the parties could come to any mutual arrangement.

After a week's adjournment to allow of the parties coming to a mutual understanding, the Committee of the House of Commons (Mr. Nicholson presiding) on Tuesday had before them the proposed new clauses of the Bury and Heywood Corporation Bills. MR. KEENE, for the Heywood Corporation, announced that the parties had come to an agreement, which would be in force for 10 years, whereby the Bury and Rochdale Corporations ran a through service of tramways between those two cities, running across Heywood, the last-named doing nothing. Each Corporation would take the profits in its respective areas. If the agreement was terminated by mutual arrangement, then the Heywood Corporation alone would have through running powers. The Committee allowed the agreement to stand part of the Bill, and clauses were adjusted to meet this.

Scotch Electricity Bills.—The Chairman of Committees of the House of Lords and the Chairman of Ways and Means of the House of Commons have reported that they are of opinion that the provisions of Clause 108 of the Colinton Tramways Order, and of Clause 10 of the Hamilton Burgh Order are of such a character that they ought to be dealt with by Private Bill and not by Provisional Order under the Private Legislation Procedure (Scotland) Act, 1899. Clause 108 of the Colinton Tramways Order provides for the company applying for and taking transfers of electric lighting orders. The petitioners against the Bill are the Hon. A. R. Douglas Elliott and Lieut.-Colonel Trotter, the North-British Railway Co., the Caledonian Railway Co., the trustees of the Craiglockhart Estate Co., the County Council of Midlothian and the Suburban District Committee of the Council, Sir A. O. Riddell and others, the Lord Provost and Council of the Royal Burgh of Edinburgh, the Water and Sewage Commissioners of Leith, and the Edinburgh and Leith Corporations Gas Commissioners. Clause 10 of the Hamilton Burgh Bill provided that "No company or person shall be entitled to supply electrical energy within the burgh without the previous consent in writing of the Corporation, and such consent may be given upon such terms and conditions as the Corporation may prescribe." The opponents of the Bill are the Caledonian Railway Co.

Nationality of Postmasters.—Sir Wm. Bull asked the Postmaster-General how many persons other than those of English birth now hold positions as postmaster or sub-postmaster; whether in view of the importance of avoiding any possibility of the interruption of telegraphic communication, he will terminate such appointments as now exist without delay; whether he can see his way to give any assurance that no further appointments of such a nature shall be made; whether he is aware that the telegraphic communications in a small area adjoining a part of the Yorkshire coast are now entirely controlled by postmasters and sub-postmasters all of German birth; and who is responsible for sanctioning the appointments. Mr. Buxton replied that most of the postmasters in Scotland and Ireland are not of English birth, but he was unable to give the numbers. He might add that foreigners are not now eligible for appointment to any permanent and established position in the Post Office, and they would not be selected for any situation for which suitable British subjects are available. The honourable member will, of course, let him have particulars of the cases to which he refers.

Sub-Engineers and the Post Office Service.—Answering Mr. Claude Hay in Tuesday's Parliamentary Papers, Mr. Buxton states that steps are being taken to promote all the sub-engineers with three years' service who passed the recent qualifying examination. The unsuccessful candidates will have adequate opportunities for study before another examination is held, the date of which is not yet arranged.

Third Readings.—In the House of Commons on June 28th the Oxford and District Tramways Bill was read a third time.

In the House of Commons on June 22nd the Edgware and Hampstead Railway Bill and the Watford and Edgware Railway Bill were read a third time.

Radium.—A remarkable contract has been made between the British Metalliferous Mines, Ltd., and Lord Ivesgh and Sir Ernest Cassel, for the supply of 7½ grammes of radium bromide at a cost of £30,000, from the company's mine in Cornwall. The radium will be presented to the Radium Institute by the purchasers.

Electric Smelting of Iron Ore.—A report has been received from South Africa by the Permanent Exhibition Committee for German industry in relation to new endeavours to smelt iron ore in the Transvaal. It is stated that the titanic or magnetic iron ore existing in large quantities in the neighbourhood of Pretoria is considered difficult to reduce, but it is now intended to smelt it with the aid of a chemical admixture forming the subject of a patent. It is proposed to invite tenders in public competition for the supply of an electric smelting furnace of a capacity of 6 tons in 24 hours. If the trials with this furnace should also yield satisfactory results, the inventor states that the Transvaal Government will request South African or transmarine capitalists to erect a large iron and steel works in the colony. The import duties on iron and steel products would, in this event, not be increased, although a bounty per ton of output made by the works is held in prospect.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Elliott Maximum Power Demand Indicator.

THE demand for electricity for power purposes has increased very rapidly during the past few years, and the question of the price to be charged is undoubtedly a most important one. One of the fairest methods is that which is based on a fixed charge per annum per kilowatt demanded, combined with a flat rate per unit registered on the meter. This gives the consumer a benefit from long-hour use, and at the same time ensures that the supply company obtains a sufficient return to cover standing charges.

It is necessary, if this system of charging is to be correctly carried out in practice, that an instrument be used which measures the maximum number of kilowatts taken under ordinary circumstances, while taking no account of any momentary excess or short-circuit. Moreover, it is absolutely essential to use an accurate instrument, for an error of a few per cent. on a large power job may mean a considerable loss of revenue.

Hitherto the instruments used for this purpose have only registered the maximum current taken, which, in the case of A.C. circuits, gives no indication of the actual power demanded. The instrument which MESSRS. ELLIOTT BROS., of the Century Works, Lewisham, are now introducing indicates the maximum power in kilowatts, and is accurate at all loads at any power factor within large variations of pressure and periodicity.

FIG. 1.

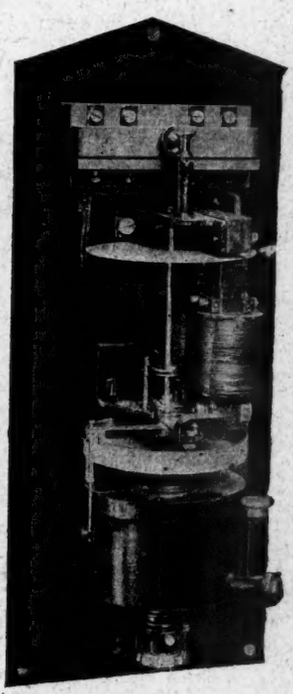

FIG. 2.

ELLIOTT M.P.D. INDICATOR.

The instrument can be made for single and polyphase, and also for D.C. circuits, and it will be seen from the accompanying illustration, fig. 2, which is of a single-phase instrument, that it consists of a disk rotating between magnets against a spring, the amount of torque measuring the kilowatts. The spindle with its disk is fixed on a float which moves in a vessel containing oil, which not only provides the retarding medium, but also reduces friction to a minimum by allowing the spindle to be pivoted on a top jewelled bearing.

The time lag can be varied according to the density of the oil, which is supplied by the makers, from one minute to one hour or more. The float very nearly fills the containing vessel so that a very small quantity of oil is required.

The registering is effected by a ratchet fixed to the spindle wheel, which also serves to carry the scale. A very light pawl prevents the ratchet wheel from moving backwards, and at the same time allows the scale to revolve to its correct reading.

The resetting is accomplished without removing the cover or seals, by lowering the oil vessel by means of a bottom thumb-screw until the pawl is released and just allows the disk to return to zero. On further screwing down the oil vessel the latter is sealed for transit.

The valuable qualities of the instrument will be readily appreciated, and the makers claim that its simplicity, accuracy, long uniform scale, and direct kilowatt readings, combine to make it a thoroughly sound piece of apparatus for the purpose of arriving at the price to be charged for power.

Street Lighting Switchgear.

The Neath Rural District Council, on the recommendation of its electrical engineer, Mr. G. H. Thomson, recently installed a novel form of switchgear for controlling the electric lights in the outlying districts. Previously the lamps were switched on and off at sub-stations by hand, and a great saving will now be effected in the wages of the men (one in each district) employed for this purpose.

The switches are further found valuable, because in the summer it was found impossible to rely on men turning out at 2 or 3 o'clock in the morning to extinguish the lights, with the result that they were often left on circuit for many unnecessary hours. Again, on bright moonlight nights artificial lighting is not necessary in rural districts, and the lights may now be put out without having to depend on reluctant men to leave their pastimes or repose for the purpose.

The new switches were supplied by MR. A. L. FURNEAUX, electrical engineer, 11 and 12, Wind Street, Swansea, who has acquired the patent rights from the inventor Mr. Campbell Smart, Swansea, and the following description and diagram will show how simple is the mechanism, and how very remote is the probability of failure. During six months' trial not the slightest hitch has occurred.

The distance switch (see fig. 3) consists of a solenoid a having a core b, which carries in a suitable position a strong pin c projecting on either side of it. Below the solenoid a and above the pin c are suspended two metal arms or guide pieces $d\,d_1$, at right angles to each other, and of such shape and so pivoted that they hang normally with their undersides sloping at a steep angle to the vertical. Below the pin c, and fastened to (but insulated from) the core b is a metal bar e carrying at each end a metal pin $f\,f_1$, which form a bridge piece capable of joining together two mercury cups suitably placed and connected into the circuit to be controlled.

On an extension of the core, below this bridge piece, is a second pin h capable of rising above, and falling to the bottom of, one or other of four slots between four upright pointed teeth $g\,g$, &c., (only two shown) arranged in a circle round the core.

This pin h, together with the slots referred to, acts as a stop to prevent the core falling too far, and also as a guide to ensure the core rising and falling vertically when the pins $f\,f_1$, of the bridge piece are leaving and entering the mercury cups. The action of the switch is as follows:—Assuming the switch to be in the off position, when current is applied to the solenoid, the core is raised

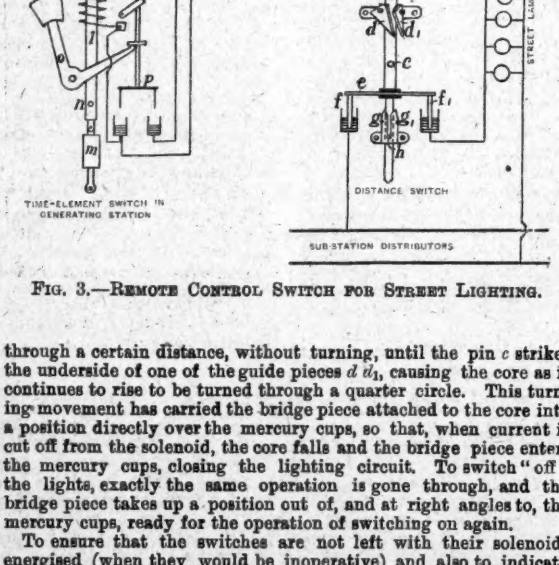

FIG. 3.—REMOTE CONTROL SWITCH FOR STREET LIGHTING.

through a certain distance, without turning, until the pin c strikes the underside of one of the guide pieces $d\,d_1$, causing the core as it continues to rise to be turned through a quarter circle. This turning movement has carried the bridge piece attached to the core into a position directly over the mercury cups, so that, when current is cut off from the solenoid, the core falls and the bridge piece enters the mercury cups, closing the lighting circuit. To switch "off" the lights, exactly the same operation is gone through, and the bridge piece takes up a position out of, and at right angles to, the mercury cups, ready for the operation of switching on again.

To ensure that the switches are not left with their solenoids energised (when they would be inoperative) and also to indicate whether the street lights are on or off, a special controlling switch, having a "time element" and an indicator, is installed at the generating station, one being connected to the pilot circuit of each distance switch; the action of this is as follows:—

When it is desired to operate a distance switch, the time-element switch in the generating station is closed by the attendant; this energises the solenoid k, as well as that of the distance switch. The core l then rises slowly against the retarding action of a dashpot m, till a pin n in the core l raises and tilts over a weighted lever o, and thus opens the pilot circuit by raising the bridge piece p out of the mercury cups. An indicator, actuated by the lever o, shows the word "on" at a small window in the cover, because the distance switch is now closed and the lights are on. The same action takes place when switching off, only that the indicator moves to "off."

The supply at Neath is 220 volts A.C. 50 periods, and the largest current controlled by any distance switch is 60 amperes, but one of them, on test, dealt perfectly satisfactorily with 90 amperes 440 volts D.C, the break being very long and quick.

The pilot wires are ·007 sq. in. and vary in length from $\frac{3}{4}$ mile to $3\frac{3}{4}$ miles' run from the generating station, and on this long line three distance switches are operated simultaneously.

Hand-Regulated Arc Lamp.

MESSRS. T. FRANCIS & SONS, 41, Hampden Street, Bolton, are introducing a simple mechanism for hand-regulated arc lamps. The device, as shown in the accompanying sketch (fig. 4), consists of two interlocking levers forced apart by a hand screw, against

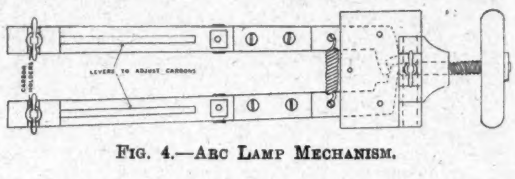

FIG. 4.—ARC LAMP MECHANISM.

the pull of a spiral spring. The carbon holders are insulated from the levers, and can be adjusted by means of the levers shown while the lamp is burning. Racks, worm gear, &c., have been completely eliminated, and the design is as simple as could be wished. The frame is made of aluminium.

Safety Pendant Lampholder.

The influence of the new Home Office Regulations is making itself felt in various directions—especially in that of avoiding the use of an earthing wire. When one considers the inconvenience and complication of running an earthing wire to every ceiling-rose and wall-socket, of using a three-wire flexible, and of adapting the roses, sockets and lampholders to receive the earth connection, or replacing these accessories with special patterns for the purpose, it will be seen that the cost of labour and material is likely to mount up to a considerable figure. To obviate this at small cost the BRITISH CENTRAL ELECTRICAL CO., LTD., of 17, Hatton Garden, E.C., who recently introduced a portable hand lamp which does not require an earthing wire, have now brought out a pendant lampholder on similar lines. The lampholder itself—of the ordinary pattern—is completely enclosed in wood, so that it is impossible to touch any part of the metal; the handle of the switch, in the case of a key-holder, is of insulating material, and the wood is soaked in melted paraffin to ensure that damp shall not render it conducting. An india-rubber ring is placed round the flexible where it enters the shank of the wood fitting, to prevent fraying of the flexible. The device is not unduly obtrusive in appearance. It has, we understand, received the approval of Mr. G. Scott Ram, Electrical Inspector to the Home Office, and has been provisionally protected.

BUSINESS NOTES.

Consular Notes.—Roumania.—The British Consul at Bucharest reports that the following electric tramways are working in Roumania: Bucharest, 5 km.; Jassy, 20 km.; Galatz, 13·3 km.; and Braila, 18 km. New lines of a total length of 40 km. are proposed at Bucharest, to be completed in 1916, and the municipality is endeavouring to find the necessary capital for their construction.

The British Vice-Consul at Galatz reports that gas and oil engines are imported in considerable numbers for use in mills for grinding maize and for other purposes. At present this demand is supplied by Germany, although British engines are no dearer than the German product. German firms, however, have agents at Galatz, whereas no British manufacturers of gas or oil engines are represented locally. An opening might be found in the district by British firms if they would appoint capable agents. Pumps are imported from Germany principally and some from the United States; it is said that British pumps are not sold because they are dearer than those of foreign manufacture. The question arises as to how British exporters should take advantage of the openings for trade if they wish to do so. Foreign firms send commercial travellers, and they appear to produce satisfactory results. British firms do not seem to approve of this method, probably because they think that the orders to be booked are not worth the trouble and expense entailed. If they do not wish to send a commercial traveller frequently, like their foreign rivals, they might, at any rate, send their representative once to report on the chances of trade, and select a suitable commission agent to carry on their business. If, however, it is not feasible to send a representative even once, firms wishing to find an outlet for their goods should apply to the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C., which is in a position to supply them with the names of commission agents and buyers, and also to give them advice. Above all things, it is desirable that British firms should not accept, at hazard, the first commission agent who may offer his services. In this district business can but rarely be done on a cash basis. Austro-Hungarian and German firms give from six to eight months' credit, but they generally take good care to inquire into the financial position of the customer. The question of credit is closely connected with the

rate of interest in the country. The local buyer will not borrow money at 8 per cent. or more in order to pay cash for British goods, even if they suit him better, if he can obtain more or less similar wares from a German or an Austro-Hungarian firm at eight months' credit. The phrase "cash against documents," which is so often the ultimatum of British exporters, is quoted, half jokingly, half sadly, by importers and commission agents when one inquires why such and such an article, which can be obtained cheaper and better in the United Kingdom, is only imported from one of our foreign rivals. It is necessary to give credit, but care must be taken to watch the market, which depends entirely upon the crops. If a good harvest is assured, all is well, but if the crops are in danger of failure, it is well to restrict business. Price lists should be in French or German, preferably the latter, prices should be in francs and centimes, and weights and measures in kilogrammes and metres. The value of a catalogue in a foreign language was amply demonstrated in Galatz in the course of the past year, when several British firms were competing for the same order. Only one firm had taken the trouble to produce a catalogue in a foreign language, and the only offer which was comprehensible was the only one taken into consideration. At the close of the year 1908 the commission agents at Galatz, whose sphere of activity extends throughout Moldavia, formed an Association known as the Union des Representants de Commerce de Galatz, with the object of defending their professional interests and the interests of the foreign firms which they represent. According to the statutes of the Union, members whose business methods are unfair or dishonest are liable to exclusion. The settlement of disputes between agents and local buyers, the defence of the interests of the creditors in cases of insolvency, and the exercise of pressure, perhaps in the form of a boycott, on those importers who refuse goods on arrival, a well-known cause of complaint, are the principal objects of the body. If this union becomes firmly established, and if it lives up to its statutes, it should be able to do much to raise the reputation of this market, which has too often suffered in the past for the faults of a few.

Spain.—The German Consul at Madrid reports that the Union Electrica Cartagena has been formed at Madrid with a capital of 10,000,000 pesetas to supply electric energy to the mining district of Cartagena.

Turkey.—Applications have been made to the Turkish Minister of Public Works for concessions for the construction of electric tramways from San Stefano to Makrikein on the Sea of Marmora, and from Bostandjik to Anatoli-Hissar on the Bosphorus.

China.—The British Consul at Antung reports that an electric lighting plant has been set up in the Japanese settlement, and both the Chinese town and the Japanese settlement share the benefit of it. The generators, which were imported from Japan, are of British manufacture.

Italy.—The British Consul at Naples reports that the work on the new smelting works at Bagnoli belonging to the Ilva Co. is progressing rapidly, and it is hoped to commence working about the end of 1909, giving employment to 2,000 workmen. Large works are being erected to collect the water from the surrounding hills, and it is hoped to obtain the 12,000 cb. metres (2,461,242 gallons) per day which are required. A large fresh water reservoir is being built. For ordinary use there is the Serino water, from the same source that supplies Naples. Powerful electric pumps are being constructed for the supply of sea water. The Ilva Co. has a capital of 20,000,000 lire (£800,000).

Tungsten Lamp Patents.—The *Electrical World*, N.Y., states that the General Electric Co., U.S.A., has purchased the patent rights to the Just-Hanaman and Kuzel tungsten lamps for America and certain other countries outside Europe. These lamps, which have been imported for some time, will, in future, be manufactured by the General Electric Co.

Electric Light in an Ancient Castle.—With reference to the article in our last issue on the electrical installation at Lumley Castle, the Earl of Scarborough's seat at Durham, we learn that the electric radiators used are of the "Electroyl" type supplied by Messrs. Purcell & Nobbs. These radiators, to the tune of £200, were selected after test by the consulting engineers and approved by his Lordship. They are in antique brass finish, with temperature-regulating switches. Provision is being made for more "Electroyl" radiators for the cold season that comes when the present one is ended.

Bankruptcy Proceedings.—J. G. S. Cunnington and H. P. Allison, electrical engineers and contractors, trading as Laing, Wharton & Cunnington, at 7, Great Newport Street, St. Martin's Lane, W.C.—The public examination was held on Wednesday, June 23rd, at the London Bankruptcy Court. The statement of affairs was referred to in our last issue. Mr. W. P. Bowyer appeared for the Official Receiver; Mr. Hair for Mr. Alfred Page, the trustee; and Mr. Harris for the debtor, Cunnington, whose examination was first taken. He stated, in reply to Mr. Bowyer, that prior to May, 1907, he had carried on the business of an electrical engineer for some years in the neighbourhood of St. Martin's Lane. In that month he entered into partnership with Mr. Allison, and they adopted the style of Laing, Wharton and Cunnington. The partnership was constituted for the express purpose of acquiring the business of the Improved Electrical Supplies, Ltd. Witness had the concern offered to him, and as he was without sufficient capital to acquire it, he entered into partnership with Mr. Allison. Asked regarding the alleged overvaluation of the business, the debtor said they did not actually take stock before purchasing, but walked through the place and viewed it in a cursory manner.

Mr. Bowyer: You do not suggest there was any concealment in the matter?—Witness replied that it was impossible to see that £5,000 worth of stock was actually there when simply walking through the premises. In the course of the action they entered a counterclaim for £3,000 on the ground of misrepresentation, but they failed in that, and ultimately judgment was given against them both on the claim and counterclaim. About the end of March they got out a balance-sheet showing the position of the firm as at the end of February, and it then appeared that they had about £3,000 surplus in the business to meet the liability of £4,000 odd in respect of the Improved Electrical Supplies, Ltd. They had since incurred fresh liabilities to the amount of about £500, but, at the same time, they had reduced the total amount of debts by £1,200.

Mr. Bowyer questioned the debtor at some length regarding the withdrawal of the firm's money in April last. Witness said each partner was entitled to draw £10 weekly from the business for household and personal expenditure. He frankly admitted that he paid two cheques for £62 10s. and £146 5s. respectively received from customers into his private banking account because his partner refused to sign cheques drawn against the firm for witness's personal needs. The £62 10s. was repaid to the firm's credit by witness out of the £146 5s. cheque, and on April 22nd he drew a cheque for £95 2s. 2d., which cleared out the firm's bank balance, and paid that into his private account. That was done because he knew that judgment in the matter of the Improved Electrical Supplies, Ltd., had been given against them, and that, consequently, the business must come to an end. The money thus withdrawn from the firm was used in paying off certain of witness's private debts and providing for living expenses.

Mr. Allison corroborated the evidence of the previous witness so far as it related to the partnership affairs, and added that he only became aware of his partner's action relative to the withdrawal of the firm's money, when informed of the facts early in May by their book-keeper. Witness, on his part, drew out £50 on May 8th for his private needs. Mr. Bowyer: Why?—Because I wanted money. You knew that trouble was coming?—Yes. And on that ground you took more than usual?—Yes. Further questioned the debtor said he might have lost a few pounds in betting during the last three years, but he was by no means a gambler. This was his first failure. Before entering into partnership with Mr. Cunnington, he was employed in India by an important electrical firm. Replying to Mr. Hair, witness said the £50 drawn out by him on May 8th was due to him on the drawing account.

The debtor Cunnington was recalled, and, in reply to Mr. Harris, said the balance of the £146 cheque, after repayment of the £62 10s., was due to him in respect of salary. This was also his first failure. The examination was concluded.

J. R. W. Middleton and A. E. E. Daniels (trading as Middleton and Co.), electricians, 11a, King Street, Dover, Kent.—The adjourned public examination of these debtors was held last week at the Guildhall, Canterbury, before Mr. Registrar Furley. The Official Receiver stated that the case had been adjourned in order that a list of the debts assigned to Mr. Letts might be produced, but these he had not yet received. In answer to the Official Receiver, the debtor Middleton stated that he had never seen Letts, who had advanced the money. The debtors were further questioned at some length by the Official Receiver, who asked that the case be again adjourned in order that the accounts might be properly prepared, and that the assignment debts might be produced. An adjournment was ultimately ordered.

The Fair Wages Clause.—In the House of Commons on June 28th, Mr. William Thorne asked the Postmaster-General what inquiries, if any, had been made in reference to the various complaints that had been made against the Western Electric Co., Woolwich, for violating the Fair Wages Clause; and, when inquiries were made, by whom they were made; and why this firm was allowed to be the only contractor asked to tender for general work. Mr. Buxton, in a written reply, said that he had arranged to receive a deputation from the Scientific Instrument Makers' and Trade Society on the subject.

Dissolutions and Liquidations.—North-Western Electricity and Power Gas Co.—A petition for the winding up of this company has been presented by Harper Bros. & Co., engineers, and D. Balfour & Son, Newcastle, creditors of the company, and it is to be heard in London on July 6th.

Mountain & Gibson, Ltd.—A petition for the winding up of this company has been presented by Cyril Renton Heron, of 143, Manchester Road, Bury, and is to be heard at Liverpool on Monday, July 5th. On June 21st, Mr. Hugh N. Bowden was appointed receiver for the debenture-holders of this company, to take possession of the assets on their behalf.

Santoni Arc Lamp and Engineering Co., Ltd.—This company, on March 1st, resolved to wind up voluntarily on account of its inability to meet its liabilities, with Mr. W. McIntosh Whyte, 11, Queen Victoria Street, E.C., as liquidator.

Geneva Tramways Co. (1906), Ltd.—This company is to be wound up voluntarily in view of the agreement with the Omnium Lyonnais de Chemin de Fer et Tramways as to sale of shares. The Hon. A. Brand, of 101, Mount Street, W., and Mr. J. Sesar, of Finsbury Pavement House, E.C., are liquidators.

United Kingdom Tramway, Light Railway and Electrical Syndicate, Ltd.—A meeting of creditors is to be held at 28, Victoria Street, S.W., on July 1st. Mr. G. E. S. Venner, liquidator.

International Telescriptor Syndicate, Ltd.—A meeting is to be held at Norfolk House, Norfolk Street, W.C., on July 28th, to hear an account of the winding up from the liquidator, Mr. R. H. Hoare.

Bury, Rochdale and Oldham Tramways Co., Ltd.—A meeting is to be held at Manchester on July 26th to hear an account of the winding up.

Schmidt Stationary Engine Co., Ltd.—A meeting is to be held at 28, Victoria Street, S.W., on July 28th, to hear an account of the winding up from the liquidator, Mr. W. T. Norton.

Buenos Ayres Electric Tramways Co. (1901), Ltd., and the Buenos Ayres Grand National and La Capital Tramways Joint Committee, Ltd.—Meetings of these companies are to be held at 62, London Wall, E.C., on August 5th, to hear an account of the winding up from the liquidators, Messrs. E. A. Lazarus and F. Thursby.

Edmunds Bros., electricians, iron and brass founders, &c., Christchurch Road, Boscombe, Bournemouth.—Messrs. F. T. Edmunds and J. C. Edmunds have dissolved partnership. Part of the business will be continued separately by each partner.

Lumb Electrical Bleaching Co., Ltd.—This company is winding up voluntarily, with Mr. W. B. Winnicott, Prudential Buildings, Queen Street, Nottingham, as liquidator.

Burroughs Adding and Registering Machine Co., Ltd.—Creditors must send particulars of their debts, &c., to Mr. W. H. Langford, 65, High Holborn, W.C., the liquidator, by August 14th.

Vaughan & Cook, Ltd.—Creditors must send particulars of their debts, &c., to the liquidator, Mr. L. V. Houseman, 1, Clement's Inn, W.C., by July 31st.

Annual Outings. — On Saturday, June 19th, the staff of the Sun Electrical Co., Ltd., held their tenth annual outing. The party went for a trip by Immisch electric launch *Rosalind* from Reading to Maidenhead, calling at Henley-on-Thames for lunch and at Marlow for tea. In the course of his remarks after lunch, Mr. A. G. Beaver, the manager, said that the progress of the firm continued on the upward grade, notwithstanding the present general low state of trade. As a matter of fact, he anticipated that this year's turnover would eclipse that of all previous years.

The thirteenth annual outing of the employés of Messrs. Galsworthy, Ltd., was held at Ramsgate on Saturday last. After dinner at the Castle Hotel, a musical programme followed, during which a silver mallet was presented to Mr. F. A. Denning, the works manager, by the employés, as a mark of their esteem. The toasts to the continued success of the firm, the visitors, &c., followed. The party afterwards went for a brake drive to Minster.

The electrical staff of the New System Private Telephone Co., Ltd., held their fourth annual outing at Hastings on Saturday, 26th ult. Dinner was served at the Old Jenny Lind, Mr. R. L. Murray, the chief engineer, being in the chair. After the usual loyal toasts, the chief engineer, in his speech, gave a brief outline of the firm's progress during the last few years, and expressed great pleasure at the loyalty of the staff during these days of keen competition.

High-Voltage 16-C.P. Metallic-Filament Lamps.—The arrival of the low-candle-power high-voltage metallic-filament lamp has been prophesied ever since the new lamps came into practical use; but those who were acquainted with the process of manufacture of metallic filaments were well aware of the great difficulties in the way, and while they were too cautious to reject the idea as impossible of achievement, they were disposed to regard it as a rather remote possibility.

Our readers will therefore be interested to learn that we have received from the Stearn Electric Lamp Co., Ltd., of 47, Victoria Street, S.W., a 16-c.p. lamp for 210 volts, made by the company at their own works by an improved process which enables the exceedingly fine filament to be produced. The lamp is, in shape, quite similar to the ordinary carbon-filament lamp, and contains nine loops of metallic filament. The consumption of the lamp is stated to be 24 watts, or at the rate of 1·5 watts per British candle-power. The efficiency is thus slightly lower than is generally claimed for metallic-filament lamps, but this is a matter of small moment, for the power consumed is still but little more than one-third of that required by carbon-filament lamps. Like the other metallic-filament lamps made by the Stearn Electric Lamp Co., the lamp is named "Leuconium." It is not actually on the market, but it is, at any rate, in existence—a specimen is burning in our office. The makers are to be congratulated on this very noteworthy advance, due, we believe, to Mr. Stearn himself; the new lamp will be of the greatest benefit, not only to the users of alternating current, but also and particularly to those who use direct current at 200 volts and upwards, who have hitherto gained little benefit from wire lamps; it will prove a most valuable weapon to suppliers in competition with gas lighting.

Catalogues and Lists.—Messrs. Hofler, Ltd., 26A, Soho Square, W.—Illustrated list showing examples of their oak panelling work.

The Sanitas Electrical Co., Ltd., 61, New Cavendish Street, W.—"The Book of the Multostat" is the title of a 42-page illustrated catalogue, in which, among other specialities, is described the Earth-Free Multostat, which, when connected to the electric light mains, generates all the various currents used in electro-therapeutics, electro-surgical work, massage, &c. The title of the apparatus means that it is so constructed as to be quite free from any danger of leakage to earth. A number of pages are occupied with particulars of accessories and appliances for use in connection with the machine. Copies of the list will be forwarded on application.

Messrs. Thos. W. Ward, Ltd., Albion Works, Sheffield.—Catalogue of close upon 400 pages, in which they give particulars and prices of a large variety of new and second-hand machinery, second-hand boilers, tanks, tubing, rails, &c., that they hold in stock.

Messrs. Nursey & Marr, 53, Victoria Street, S.W.—16-page booklet (Section D) describing their small petrol-electric generating sets, switchboards and batteries, for private installations.

Messrs. Krupka & Jacoby, 11, Queen Victoria Street, E.C.—16-page illustrated pamphlet, entitled "What Every Woman Should Know," showing the patent "Sucleen" vacuum cleaner for electrical and hand power which they are placing upon the market. Its construction is described, and a view of the interior of the machine appears. Prices are stated.

Messrs. C. A. Vandervell & Co., Warple Way, Acton Vale, W.—Well illustrated 16-page publication—"Electricity *versus* Acetylene and Oil"—containing an account of the "C.A.V." system of electric lighting for motor-cars, motor-boats, &c., by the Leitner variable speed dynamos. Full particulars of the different parts—dynamo, automatic switch and battery—appear, together with line drawings and diagrams of alternative wiring schemes for car lighting, and illustrations of a few types of lamps. Motor-car owners and others interested can obtain a copy of the list by applying to the firm.

Messrs. Weldless Chains, Ltd., Gartsherrie, Coatbridge.—Pamphlet No. 5, giving description and prices of the "Universal" patent chain adjuster for shortening, joining or adjusting the length of chains and slings.

The British Prometheus Co., Ltd., Salop Street Works, Highgate, Birmingham.—16-page catalogue (No. 137) describing their new system of electric cooking by incandescent heat. It is expected that this system will have an important influence in increasing the popularity of electric cooking apparatus. A copy of the pamphlet should be obtained by all interested in the subject.

The Reason Manufacturing Co., Ltd., Brighton.—Fourth edition of their catalogue of street lighting fittings and accessories. It is neatly produced in loose-leaf form, in an expanding file binder allowing of the inclusion of additional lists as issued. A number of new designs of fittings are included, and many of the original patterns have been modified to suit modern requirements. The booklet is divided into sections dealing respectively with lanterns, brackets, pendant lanterns, water-tight fittings, and switches and accessories, and while electric street lighting with metal-filament lamps is receiving such great attention, electricity works engineers would find the list, which is fully-illustrated and gives prices, of considerable service to them. A second catalogue (40 pages) deals very fully with Clark Fisher potentiometers and accessories, describing the 15-unit ordinary and 35 and 150-unit compensating potentiometers, as well as a number of accessories. Notes on the method of use, and special points on compensating, together with general hints on potentiometry, are followed with a list of prices.

Messrs. Anderson's Bristol Rubber Co., Ltd., St. Mary-le-Port Street, Bristol.—Catalogue, with a note of trade discounts, of belting hose and other rubber and asbestos goods.

Hart Accumulator Co., Ltd., 35, Marshgate Lane, Stratford, E.—Small and neat pocket edition (stiff covers) of their 1909 catalogue. In the course of its 70 pages it gives lists of places where the cells are used, instructions for erecting and working same, illustrations with tabulated price and other particulars of "N" lighting type cells, special batteries for 25-volt metallic-filament lamps, special cells for traction work, central station cells, ignition batteries, portable batteries, sheet separators, and a number of sundries.

British Insulated and Helsby Cables, Ltd., Prescot.—Pamphlet No. P97 (16 pages), containing illustrated particulars of their Prescot house service boxes (non-disconnecting type) for low-tension concentric and triple-concentric mains; No. P101 (six pages) gives tabulated and other information regarding Monnot copper-clad steel wire for electrical purposes.

Weston Electrical Instrument Co., Audrey House, Ely Place, Holborn, W.C.—Small 32-page pocket-size preliminary list, giving particulars, prices and illustrations of some new Weston instruments, A.C. and D.C. types, which they are now placing upon the market.

Messrs. G.m.b.H. Classen & Co., Barbarossastrasse, 16, Berlin, W 30.—Price list of "Fludor" soldering materials—paste, cored solder, fluid, &c., and spirit lamp.

Book Notices.—*Electrical Practice in Collieries.* By Daniel Burns. London: C. Griffin & Co., Ltd. Price 7s. 6d. net. Third edition.—The call for a third edition of this book, which forms one of Messrs. Griffin's excellent series of "Scientific Text-Books," shows that there was a demand for a work of this description. We reviewed the second edition some time ago, and pointed out that there was a lack of explanatory matter relating to the construction of electrical machinery, and we regret to find that the present edition is practically a reprint of the second. Chapter I, however, has an addition of a few useful notes on "earthing," "three-phase cables," and "coal-cutter trailing cables." Chapters II, III and IV have not been altered, while Chapter V has a description of the Nernst lamp added, but we notice the illustration is upside down. Chapter VII has also been improved by a description of electrical "gathering" and "rack-rail" locomotives for underground haulage. Chapter VIII has a description of the Sullivan electric coal-cutter added, but we also note that fig. 118 is printed upside down; and Chapter IX has been enlarged with a few notes on electrical winding. As a text-book for the use of mining students studying for the various examinations in mining

science, it no doubt serves a useful purpose, and the numerous arithmetical examples are very helpful to the student. The volume would be very much improved, even as a text-book, if a little more information and explanation were added to the chapters dealing with dynamos and motors, much of which is quite out of date, and, in fact, before another edition is published, we would recommend the entire re-writing of this portion of the work.

Trade Announcements.—We are asked to state that, in view of the increase of business in their large gas engine department, and of their intention to take up the direct sale of their Diesel oil engines in England, the M.A.N. (Maschinenfabrik Augsburg-Nürnberg A.G.) — in the English gas engine trade hitherto known in England as "The Nuremberg Co."—have, as a result of a friendly arrangement, terminated their agency agreement with Mr. James Halcrow, 18, Coleman Street, London, E.C., and have opened an office in London. All communications should in future be addressed M.A.N., 219, Caxton House, Westminster S.W. Telegraphic address, "Klettillo, London." Telephone "3775 Victoria."

MESSRS. JACKMAN & MARCHANT, electrical engineers, have opened new premises at 69, Sandgate Road, Folkestone.

MR. H. W. TEETON, electrical engineer, has removed from 7, 9 and 11, Albion Street, to 19, Lichfield Street, Hanley, Staffs.

MESSRS J. E. NEAL & SONS, electricians, 402-4, Evelyn Street, Deptford, S.E., announce that they are retiring from business. The stock is to be disposed of by auction.

New Zealand and British Trade.—Press dispatches from Wellington, N.Z., quote Mr. McKenzie, Minister for Agriculture, as follows:—"We hear a good deal about patriotism, but when it is remembered that the money spent on importing goods from foreign countries assists those countries to build armaments for the destruction of our commerce and the humiliation of our flag, we are constrained to advocate a policy on the lines of that of Canada, and give a preference to British goods in British markets."

Brescia Electrical Exhibition.—Those who are interested in this international exhibition (August to October next), can obtain particulars from the Italian Chamber of Commerce, 4, St. Mary Axe, London, E.C.

LIGHTING and POWER NOTES.

Baillieborough (Ireland).—The R.D.C. has petitioned the L.G.B. to grant it urban powers for the purpose of giving effect to the proposed electric lighting scheme for the town.

Barnstaple.—At the last meeting of the Board of Guardians the Visiting Committee recommended that the house, hitherto lit by oil lamps, be lighted either with gas or electricity. The cost of installing gas would range, according to the tenders received, from £63 to £95, and for electricity, from £125 to £152. Mr. H. Radford said they had ascertained the cost of lighting Taunton and Exeter workhouses by gas and electricity, respectively, and on this basis electricity would cost 8s. 2d. per lamp, and gas 8s. 5½d. per lamp per annum. He was satisfied that if electricity was adopted it would prove cheapest, most convenient and safest. The Master said the workhouse cost £23 10s. to light with oil last year. Mr. M. Clogg thought that gas would be more useful for heating and cooking. The Chairman pointed out that the workhouse was heated with hot water pipes, and that the cooking was in connection with the same installation. If jets were left on by careless persons —and they had to remember that some of the inmates in that institution were "on the border-land"—there would be more danger than with electricity. Several members strongly advocated the claims of electricity, whilst one or two championed the use of gas. It was decided by a large majority to install the electric light, only six members voting for gas.

Bath.—A L.G.B. inquiry was held on June 23rd relative to the application of the T.C. for a loan of £11,700 for electric light purposes. There was no opposition. The sum is made up as follows:—Spent in excess of loans and on work for which a loan has not been applied for, £5,199 11s. 8d.; mains extensions and services, £6,000; automatic stokers, £500. The inquiry was adjourned until July 2nd.

Canada.—The Minister of Railways and Canals has agreed to grant a lease to the Northumberland-Durham Power Co. at Port Hope, of the remaining portion of the Healey Falls water power controlled by the Federal Government. Development of the power will proceed concurrently with the construction of the Trent Valley Canal which passes through the company's property, and will also facilitate the early construction of the Cobourg, Port Hope and Havelock Electric Railway.

Cape Colony.—UITENHAGE.—On June 4th the Mayor laid the foundation stone of the electric power house. The Deputy-Mayor explained that the town was to be lighted by 16 arc lamps of 1,250 C.P. each and 280 lamps of 40 C.P. each. It is expected that the scheme will be sufficiently advanced to light the streets within six months. Private lighting will follow.

Chile.—La Sociedad de Alumbrado Electrico, of Punta Arenas, has secured a concession to install poles and electrical mains in the streets of the town in connection with the electric lighting undertaking during a period of 20 years.

Continental Notes.—GERMANY.—The Paderborner Electricitätswerke und Strassenbahn Gesellschaft is the title of a new company, which has just been formed at Paderborn, with a capital of £60,000, to acquire and extend the electric tramways in the town and to establish a central electric lighting station. The Rhenische-Westfalische Electricitätswerke Gesellschaft is interested in the new undertaking.

Droylsden.—The local co-operative society has decided to light its premises by electricity in place of gas. The parish church is also to be wired, and several large firms have decided to become consumers of electricity.

Finchley.—The accounts of the electricity undertaking for the year ending March 31st last show that on capital account there was spent during the 12 months £13,405, as against £12,638 in the previous year. The maximum load had increased from 509 to 610 KW., and the amount of electricity generated had increased from 897,502 units to 980,000 units. The amount sold to consumers was 580,750 units, as against 485,060 in the preceding year, and for public lighting 233,725 units had been sold, as against 244,700 in the previous year. The income from private lighting was £9,433, as against £8,000 in 1907-8. The receipts from power had increased from £642 to £797, while the amount for public lighting had decreased from £1,685 to £1,678. The balance carried to net revenue was £6,809, as against £5,550 last year. After payment of interest, &c., there was a balance of £86 odd to carry forward, as against a deficit of £292 last year.

Gosport.—The U.D.C. has decided to give the gas company 12 months' notice to terminate its agreement for street lighting, and then to ask for fresh terms. It was pointed out by Mr. Harvey that the cost of gas at 3s. per 1,000 cb. ft. worked out at £2 12s. 6d. per lamp per year, which, at their present price, left £1 for labour and maintenance. But electric light at 2½d. per unit would be £3 per lamp; or 12s. 6d. cheaper than gas. It was desired to light the Fareham Road with electric light, but negotiations could not be entered into until the gas company had received notice.

Llanberis.—The P.C. has asked Mr. Paton, of the Electric Power Co., to submit terms for lighting the parish by electricity.

London.—POPLAR. — Negotiations have taken place between the borough electrical engineer and the engineer of the Stepney undertaking, for a supply in bulk to Stepney during the removal of plant to the new generating station. The contemplated demand is for a minimum of 250 KW. running continuously for 24 hours per day, except for a short interval on Sundays, with liberty to raise the demand to 500 KW. The contract is to run from July 1st to September 30th, 1909, the price to be 0·3d. per unit, for all energy supplied, untransformed, at the Limehouse sub-station, subject to a clause relating to coal strikes. The minimum quantity is estimated at 550,000 units. The committee has agreed to the foregoing arrangements.

MARYLEBONE.—The general manager (Mr. Seabrook) of the electricity undertaking has reported to his committee that the sale of current for lighting purposes is going to seriously decrease when the metallic-filament lamp becomes better known, and from other directions the department is likely to experience a decreased revenue. In a year or so there would also be an increased assessment. His position was that he had two different and equally important classes of work to do (1) overhaul of organisation; (2) development of supply. He was anxious, and it was necessary for the two to go on simultaneously, but he did not feel it would be wise to tackle the two together single-handed, and he asked permission to engage a gentleman (Mr. H. H. Holmes, sales manager at West Ham) of great experience in the direction of development, at a salary of £400 a year. Mr. Holmes was aged 32. The committee decided in favour of Mr. Holmes being appointed, subject to a month's notice on either side.

Maidstone.—The local gas company has written to the Mayor protesting against the proposal of the Corporation to convert 158 street lamps to electric lighting.

Morecambe.—The Electric Lighting Committee has decided that the engineer shall report on the possible improvement of the Corporation electrical plant, by substituting either oil or gas for steam power.

Plymouth.—The T.C. has decided to extend the mains in order to supply electricity for lighting and power to the works of the new Patent Candle Co., and Messrs. R. & R. Bayly, Sutton Road.

Radcliffe (Lancs.).—The U.D.C. has received sanction to a loan of £4,336 for additional generating plant.

A supply of energy for power purposes to the new mill of Messrs. J. C. Hamer, Ltd., has been offered at ⅜d. per unit net.

St. Germans.—A committee of the Board of Guardians recently passed a resolution recommending the acceptance of the tender of the West of England Agricultural Co-operative Society for installing the electric light in the workhouse. After some discussion by the Guardians the matter was deferred.

Shrewsbury.—The E.L. Committee is urging the necessity of developing the electrical undertaking, and that a loan of £10,000 should be obtained for this purpose. Among the various

items included in the above are mains, £2,700; services, £900; meters, £450; mechanical stokers, £900; boiler, pump, &c., £800; street lighting, £500; amount overspent on capital account, £3,672, &c.

Southampton.—The borough electrical engineer has been in communication with the South-Western Railway Co. as to the supply of energy to the Docks, the present supply from the company's own works being insufficient. The company's chief engineer asked whether the Corporation would be prepared to supply the whole of the Docks with electricity. The consumption at present is about 1¼ million units; at the end of the present year it will be about 1¾ millions, reaching 2 millions on the completion of the new wet dock. The price offered was 1d. per unit, which would bring in a revenue of between £7,000 and £8,000 per year. The borough electrical engineer informed his Committee that the present opportunity appeared the last the municipality would ever have of supplying that undertaking with electricity. The Committee decided to accept the offer of the company for a supply at 1¼d. per unit on a consumption of not less than 400,000 and not more than 600,000 units per annum conditionally that the supply is a day load and is partially discontinued during the months of December and January.

Uxbridge.—Dr. Lock, the medical officer to the Guardians, has written to the Board, urging it to consider the advisability of substituting electricity for gas in those portions of the workhouse in which the last-mentioned illuminant is used. Dr. Lock says: "From every point of view electric light is superior for surgical and medical purposes. It is healthier, cleaner, safer and more economical, and perhaps the most important point is that by means of wall plugs and hand lamps it can instantly be brought to any point in the ward for examination, operative and nursing purposes. In every hospital with which I am acquainted electric light has been installed and gas superseded. The Metropolitan Asylums Board last year, after carefully comparing and considering the two systems, came conclusively to the opinion that electric light is healthier, cleaner, safer, more convenient and more economical, and have installed it universally in their institutions. Your advising engineer, Mr. Wingfield Bold, is very strongly of the same opinion. Your gas bill for the last 12 months was £161 9s. 8d., more than double the electric light bill, which was £77 8s., while the number of lights by each system is probably nearly the same." In conclusion, the medical officer asked that in any case a certain number of electric light sockets be put in each ward.

Walthamstow.—A recommendation of the electrical engineer has been adopted with reference to the lighting of shops by means of Osram lamps. The terms are to be as follows:—200-c.p. lamps at a minimum inclusive price for current and maintenance of £2 10s. per lamp per annum, and 100-c.p. lamps at £1 10s. per lamp per annum, the charges to be based on a consumption of 150 and 80 units per lamp per annum respectively.

Whitchurch.—The Llandaff and Dinas Powis R.D.C. has applied for a loan of £2,960 for the provision of E.L. plant at Whitchurch.

Yardley.—A difficulty has arisen over the electric lighting. A few nights ago a special meeting of the District Council was held, when the following recommendation from the Tramways and Electric Lighting Committee was presented:—"That in view of the serious objections to the terms of the agreement with the City of Birmingham Tramways Co., Ltd., of June 8th, 1908, raised by the reports of the Council's electrical engineer (Mr. C. H. Gadsby) and the consequent impossibility of framing a scheme for putting into operation the Council's electric lighting orders, based on such agreement, which would be at all likely to meet with the approval of the B. of T. and L.G.B, notice be given to the said company terminating the agreement, above referred to." Mr. A. Blackham, the chairman of the Council, in moving the adoption of the recommendation, pointed out that there appeared to be a good deal of misconception as to the position of affairs. It seemed to be feared that with the carrying out of the recommendation the whole of the Council's electric lighting order fell to the ground, and the work had to be commenced again. That was not so. Of course, the Committee had been compelled during the past few months to do all it could to carry out the agreement, but the recommendation now proposed only affected, as they knew, one particular part of the electricity supply scheme, that of traction, and did not touch the general supply of electricity to the district. Speaking for himself and not for the Council, he could not help feeling that the threatened annexation of the district was an element in the question which they could not exclude, and which would have to be very carefully considered if the matter came up for consideration. Mr. S. Mason seconded the motion, and Mr. Blackham stated that it was not advisable for the Council to discuss the new schemes prepared at present. The motion was carried.

TRAMWAY and RAILWAY NOTES.

Chile.—A project has been submitted to the Chilian Government by Don Roberto von Braun to convert the No. 1 section of the State Railways to electric traction, and a Special Commission has been appointed to consider and report upon the cheme.

Continental Notes. — Switzerland. — The *Feuille Fédérale Suisse* publishes particulars of a decree granting to a preliminary committee, represented by M. Antonio Soldini, of Bissone, an 80 years' concession for the construction and working of an electric tramway from Capolago to Bissone. The line will be single track, and of 1 metre gauge.

According to the latest returns, the length of electrical lines, which in 1901 was 400 km., amounted to 1,019 km. in 1908, which represented about 18 per cent. of the Swiss railway system. The total amount of capital invested, so far, in electrical railways and tramways, is about 104,000,000 fr.

Spain.—La Société des Tramways de Madrid is about to commence the construction of a new line of electric tramway between the Paseo de Recoletos and the Calle de Florida in the Spanish capital.

Dartford.—The U.D.C. on June 24th sealed the assignment of the lease of the tramways from Messrs. J. G. White & Co., Ltd., to Messrs. Balfour, Beatty & Co., Ltd.

Fife.—Dunfermline T.C. has had a conference with representatives and the promoters of the tramway company which proposes to run tramways from Kirkcaldy to Inverkeithing by way of Burntisland and Aberdour. An agreement had been come to with the other local authorities, and the company desired permission to enter the south side of Dunfermline. Another company, which has running powers between Dunfermline and Lochgelly, has, however, intimated its intention of constructing a tramway to link up Dunfermline with the naval base at Rosyth, and it is understood that in the event of its powers being put into operation, the promoters of the Kirkcaldy to Inverkeithing scheme will not proceed with the proposal to enter Dunfermline but will link up with the other system at Inverkeithing. It is stated that there is every prospect of the line from Inverkeithing to Kirkcaldy being carried through. This tramway is to connect with the Corporation system at Kirkcaldy, and the entire scheme will provide a direct route of tramway all the way from Inverkeithing to Leven, a distance of about 16 miles.

Halifax.—The B. of T. has refused the application of the Corporation for doubling the tramway between Broad Street and Woolshops, also for a loop line in Broad Street and a further line in George Street. Col. Druitt states that he is not convinced of the necessity for the new work, which would be undertaken against the wishes of the owners of property affected.

Leeds.—The opening of the last section of the Yeadon and Guiseley extension of the Corporation lines was fixed for Wednesday last, when the B. of T. inspection would also take place.

London.—The Metropolitan Railway Co. announces that from July 1st, it will run a number of non-stop trains from stations on the Aylesbury extension to the City without change at Baker Street, as heretofore. For this purpose, an additional junction has been provided at Baker Street.

Middlesex.—At the meeting of the County Council on June 24th the Highways Committee reported that it had been agreed to join with London in a Bill for the proposed tramway from Cricklewood to Marble Arch. Under this scheme Middlesex will construct the tramway (on the overhead trolley system) and widen the road from Cricklewood to Netherwood Street at an estimated cost of £80,000. The portion of the line from Netherwood Street to Bridge Terrace is to be constructed by the L.C.C. at an estimated cost of £70,000. From Bridge Terrrace to Marble Arch the tramway is to be on the conduit system, and from Netherwood Street to Bridge Terrace on the dual system of overhead trolley and conduit. The managing director of the lessee company is prepared to recommend his board to take a lease of the Middlesex portion of the tramway. On the recommendation of the Committee the Council passed a resolution approving of the principle of the proposed scheme.

U.S.A.—According to the daily Press, some 3,000 street car employés of Pittsburg, Allegheny City and district struck work on Sunday last, shutting down over 600 miles of tramways, &c. When the local steel workers found that they were deprived of their usual holiday, an attempt was made to wreck the cars and mob the strikers.

New York.—The New York, New Haven and Hartford Railroad Co. has decided to electrify its entire line from New York to New Haven; the electric zone now runs only to Stamford. The company intends also to electrify the Harlem River branch, which runs from the Harlem River to New Rochelle. It is proposed that four tracks on each of these roads be electrified. It is expected that the work will be completed in about 18 months. It was decided at the directors' meeting on June 12th that the electrical extension should first be operated for freight, and later for passengers. The work, which will cost $20,000,000, will be put up to open competition.

Chicago.—The final report of the Subway Bureau of the City of Chicago has been made public. The *Electrical World*, N.Y., says that it contains four sets of plans for subways for street railways in the central district, ranging in estimated cost from $100,000,000 to $112,000,000. Each of the plans is so arranged that it may be made to include, besides the subway itself, galleries for public utilities. The plan which appears to meet with most favour provides for the construction of six through routes; two of these will connect the north side and south side, two the north side and west side and the others the south side and west side. This plan also contemplates a subway which will run around the heart of the city in close proximity to nearly all the railroad stations. The

plans provide for a seating capacity of about 500,000 passengers; this should provide for the growth of the population of Chicago, at the present rate of increase, until the year 1932. Including standing room, the system will not reach its ultimate maximum capacity until 1950. The plans are not worked out in detail, and the proposals are largely tentative in form.

TELEGRAPH and TELEPHONE NOTES.

Imperial Press Conference.—On Friday last the committee appointed to consider "Cable Rates and Press Intercommunication" presented its report to the Conference. The committee had passed resolutions to the effect that it was urgently necessary that the Governments of the British Empire should take steps to increase the means and to reduce the cost of electric communication between the different parts of the Empire; that steps should be taken to draw the attention of the India and Colonial Offices and the Eastern Telegraph Co. to the high charges made by the Indian authorities on all cable messages to and from the United Kingdom placed on the Indian wires, and to the present scale between ordinary and Press cable rates, with a view to securing immediate relief in both respects; that the attention of the Colonial office and the companies be called to the prohibitive rates at present obtaining in the West Indies; and that the desirability of establishing a chain of wireless telegraph stations between all British countries, for the cheapening of electrical intercommunications and for the safety of the mercantile marine, be urged upon the Governments concerned.

A further resolution called upon the secretary to inquire whether the Pacific Cable Board and the Eastern Telegraph Co. were prepared to grant a reduced Press rate.

The Chairman (the Hon. H. L. W. Lawson) stated that in reply to the last proposition the Pacific Cable Board had consented to reduce their charges for Press messages to one-half. The New Zealand Government would similarly reduce its terminal charge, and probably the Commonwealth Government would do likewise.

It was agreed that the standing committee, of which five members would form a quorum, should continue to act on behalf of the Conference until the next Conference was held, and the resolutions were adopted unanimously.

In the discussion Mr. Moberly Bell pointed out that the concession made by the Pacific Cable Board represented a reduction of 2½d., reducing the Press rate to Australia from 1s. to 9½d. a word. Mr. T. Temperley said that while the Pacific cable was 7,800 miles long, and the Atlantic cables only 1,800 to 2,000 miles, the Atlantic cable companies received 5d. a word, and the Board received only 4d. to Australia and 5d. to New Zealand.

Mr. P. D. Ross reintroduced his resolution that there should be State-owned electric communication between the British Isles and Canada, and State control of electric communication across Canada. He pointed out that he did not use the words "Atlantic cable," as he believed that they were on the eve of great advances in wireless telegraphy. Mr. Marconi had said that morning that next August he hoped to be able to supply a service of 15,000 words at least across the Atlantic at half the existing cable rates.

Mr. Marconi said that at present there were difficulties in connection with transmission over the landlines of the North American continent, but he believed they could be overcome. The cost of stations capable of communicating over a distance of 3,000 miles would be about £50,000 each. In the near future, he believed, distances of 6,000 miles or more might be covered. At present they could transmit a limited amount of Press messages across the Atlantic at 2½d. a word; if the traffic was considerable the charge might be reduced to 2d. a word between England and Canada. The present speed across the Atlantic, he said, was 25 words a minute; they hoped to double it by duplexing.

The question whether the resolution should refer to cables or to wireless communication was discussed at some length. Mr. E. S. Cunningham remarked that wireless could not yet be regarded as practicable, and that the resolution therefore implied either State competition with private interests (which was practically confiscation) or purchase of the latter; and Mr. Charles Bright pointed out that the speed of cable telegraphy had been estimated at half the proper value, while the cost of an Atlantic cable was not one million sterling, as had been stated, but half a million. Eventually the resolution was adopted.

Other resolutions recommended the establishment of State-owned electric communication between Great Britain and South Africa, and that the Governments of Australia and New Zealand be asked to co-operate with the Pacific Cable Board in reducing the cost of Press messages.

Several of the resolutions were brought before the Prime Minister yesterday. Mr. Asquith received the deputation with sympathy, and assured the members that such influence as the Government possessed would be used in the direction of the reduction of rates. He pointed out, in fairness to the cable companies, that they had provided a world-wide system of enormous value to the Empire, and had very substantially reduced their rates in recent years. He agreed that any Imperial line of communication ought to be self-supporting, and that wireless communication could not be ignored, but pointed out that Mr. Marconi had not yet applied for the facilities which the Postmaster-General was bound to give as soon as he could show that he could carry on a service across the Atlantic with reasonable facility and speed. The Government would be anxious to keep in touch with the standing committee, which he regarded as the solid and substantial result of their deliberations on the acknowledged necessity of cheap and certain electric communication for the Empire.

Newfoundland.—As the result of a change of Ministry, the Government has declined to ratify the agreement with the Commercial Cable Co. made last February. The agreement, says Reuter, granted the company a special concession equivalent to the free landing of a new cable on the colony's shore next month, whereas the other companies are obliged to pay 4,000 dollars a year cable tax. The Government insists that the Commercial Cable Co. shall pay the same tax.

Portsmouth.—The Corporation Telephone Committee has been asked whether it will be prepared to combine with its own the service of the National Telephone Co. in its area, when the latter has to be taken over by the Post Office. The charges which the latter proposes to levy are very much higher than the municipal rates. The Committee is, however, slightly raising the rates for the lower scales. The Corporation's licence does not run out for another 16 years. There was a decrease in ordinary expenditure of £117 last year as compared with the previous year, and the income was also less by £138. Principal and interest payments were also heavier, and after all charges were met, including a payment of £1,011 to the Post Office as royalty, the sum to be carried forward is £140, which is £100 less than in 1907-8. The Committee has gone thoroughly into the question of rates, and finds that there has been a loss on the cheapest service. It will retain as at present the unlimited service rate at £5 17s. 6d., the second connection at £5 5s., and the service of 1,800 calls for £5, but the service of 1,000 calls, which hitherto has been charged £4, is to be raised to £4 5s.; and the £3 15s. toll service plus a halfpenny per call is to be abolished, while the £2 10s. service plus a penny per call is to be raised to £3 and a penny per call. The principal rates of the Post Office and the Portsmouth and Hull municipal services will therefore compare as follows:—

		Hull.		
Calls.	P.O.	Business.	Residence.	Portsmouth. Business and residence.
1,000	£7 0 0	£5 0 0		£4 5 0
1,800	£9 10 0	£6 6 0	£5 0 0	£5 0 0
		(unlimited tariff)		
4,000	£14 0 0	£6 6 0	£5 0 0	£5 17 6
		(unlimited).		

Post Office Agreements.—On Monday, at Dublin, Mr. Justice Dodd decided that while telegraph apparatus and workmen were carried free of charge by the Great Southern and Western Railway of Ireland, under agreement with the P.M.G., the covenant did not cover telephone apparatus and employés, and therefore the carriage of these would have to be paid for.

Telegraphic Interruptions and Repairs:—

	Interrupted.	Repaired.
Jamaica-Colon	May 6, 1909	June 3, 1909
Dakar-Conakry	May 18, 1909	
Tangier-Cadiz	May 19, 1909	
Paramaribo-Cayenne	June 8, 1909	June 27, 1909
Cayenne-Salinas	June 7, 1909	
Rome-Constantinople	June 14, 1909	June 16, 1909
Trinidad-Demerara	June 19, 1909	

CONTRACTS OPEN and CLOSED.

OPEN.

Acton.—July 12th. Lead-covered paper-insulated cables for the U.D.C. See "Official Notices" June 18th.

Australia.—MELBOURNE.—July 14th. One direct-current steam-driven generating set of 1,000, 1,250 or 1,500 KW., for the Council. See "Official Notices" May 14th.

MELBOURNE.—August 4th. Overhead travelling crane, for the Electricity Supply Committee. See "Official Notices" June 4th.

MELBOURNE.—August 4th. Overhead travelling crane for the Council. See "Official Notices" June 11th.

MELBOURNE.—July 7th. 18 transformers for the City Council. See "Official Notices" June 18th.

MELBOURNE.—July 7th. 80 A.C. flame arc lamps for the Council. See "Official Notices" June 25th.

MELBOURNE.—July 23rd. Insulated copper cables for the Council. See "Official Notices" to-day.

Belfast.—Feeder panels for lighting switchboard in the Corporation electricity supply works. See "Official Notices" June 11th.

Belgium.—July 10th. The municipal authorities of Tongres are inviting tenders for the contract for the extension of the electric lighting undertaking.

July 14th.—Tenders are being invited until July 14th by the Société Nationale des Chemins de Fer Vicinaux, of Brussels (14, Rue de la Science), for transformer sub-station plant (continuous to alternating current) in connection with the Spa-Verviers electric railway.

Canada.—WINNIPEG.—August 2nd and 16th. The city of Winnipeg is advertising for tenders for the hydraulic and electric equipment of the generating station now under construction on the Winnipeg River, at Thirty-foot Falls. The initial installation will consist of five direct-connected 3,000-K.V.A

60-cycle three-phase generating units, and two banks of transformers, each consisting of three single-phase transformers of 3,000 K.V.A. capacity. All electrical control and other auxiliary apparatus, excepting turbine governors, will also be tendered on at the present. Tenders for the hydraulic machinery are due on August 2nd, and for the electrical equipment on August 16th. The distribution of plans and specifications will be made from the office of Messrs. Smith, Kerry & Chace, Winnipeg, Man. The contractors at the site of the works have made good progress, have a large plant installed, have unwatered the power house, and will shortly begin placing concrete in the dams and walls of plant. The execution of the transmission line contract is well under way, and shipments of towers, cables and insulators will begin during June, July and August, respectively.

France.—July 21st. The Paris municipal authorities are inviting tenders for a 60-H.P. steam engine and a 40-KW. continuous-current dynamo at the Paris Municipal School of Physics and Industrial Chemistry.

Germany.—COLOGNE.—July 15th. The Städtische Maschinenbau-Amt requires tenders for four electrically-driven goods lifts for the harbour installations on the left bank of the Rhine. Particulars may be obtained at 1s. 6d. per set.

EMDEN.—July 20th. The Koenigliche Maschinenbau-inspection requires two electrically-worked bucket dredges.

SAARBBUECKEN.—July 19th. The Prussian State Railways require a number of cranes and a transporter bridge.

Gravesend.—July 3rd. Automatic stoker for the Electricity Committee. See "Official Notices" June 11th.

Hornsey.—Electric light installation for the North Harringay Schools, for the B.C. A reference to this matter appears in our "Business Notes" June 25th.

Italy.—VENICE.—July 10th. The Director-General of the Arsenal of Marine requires tenders for two lots of electric lamps and carriers estimated at £1,032. A deposit of 10 per cent. is required.

London.—ST. PANCRAS.—July 10th. Arc lamp carbons for the B.C. See "Official Notices" April 30th.

Luton.—July 19th. 500-KW. steam-driven generator, and condensing plant for the Electricity Department. See "Official Notices" to-day.

Manchester.—July 13th. Special permanent way tramway trackwork for the T.C. (deposit £2 2s.). J. M. M'Elroy, General Manager, 55, Piccadilly, Manchester.

Pontypridd.—July 12th. Condensing plant, circulating pump, air pumps, pipe work, &c., for the U.D.C. electricity department. See "Official Notices" June 25th.

Rotherham.—July 13th. Meters for the Electricity Department. See "Official Notices" June 18th.

Salford.—July 12th. Re-wiring at the Royal Technical Institute for the Electricity Committee. See "Official Notices" to-day.

Spain.—The municipal authorities of Castellon are at present inviting tenders for the concession for the electric lighting of the town.

Stevenage.—The U.D.C. is prepared to receive applications from companies or persons willing to carry out its provisional order. See "Official Notices" June 11th.

Swansea.—July 7th and 14th. Arc lamps, resistances, choking coils, &c.; cables; arc lamp pillars, brackets and gear; arc lamp feeder pillars, joint boxes, &c., for the Corporation Electricity Department. See "Official Notices" June 25th.

Wallasey.—July 12th. Battery, reversible booster and switchboard for the U.D.C. See "Official Notices" June 25th.

Whitehaven.—July 20th. Lighting the Harbour Quays for five years, by electricity, gas, or other means, for the Harbour Commissioners. See "Official Notices" June 11th.

CLOSED.

Barking.—The Electricity Committee has received the following tenders for the supply of a 250-KW. three-phase alternator, switchboard and motor:—

	Sec. 1.	Sec. 2.	Sec. 3.
Brush Electrical Engineering Co.	£254	£112	£84
General Electric Co.	360	154	87
Crompton & Co. .. .. (accepted for Sec. 1)	340	175	90
Electric Construction Co.	405	116	83
Electrical Co.	395	128	100
British Thomson-Houston Co.	402	143	110
Vickers, Sons & Maxim, Ltd.	456	109	91
Bruce Peebles & Co.	450	120	107
British Westinghouse Co.	438	135	118
Siemens Bros. Dynamo Works, Ltd. (accepted for Secs. 1 and 2) (Query)	536	102	80
Ferranti, Ltd.	—	109	—

Burnley.—The Education Committee has accepted the tender of Messrs. Simpson Bros., of Burnley and Hapton, amounting to £1,425, for the electrical installation at the new Technical School, as per specifications of the borough surveyor and electrical engineer.

Canada.—Our correspondent writes that the contract for the building of the electric line between Cobalt and Haileybury was let to the Nova Scotia Construction Co., of Sydney, C.B., for $125,000, work to commence within a week from the Cobalt end. The contract calls for the completion of the grading, ties and rails to be laid by September 1st. Final arrangements for power to operate cars have not yet been decided upon, but one of the various companies constructing plants on the Montreal River will supply it.

Dundee.—The offer of Messrs. Kelvin & White to supply the main switchboard for the Dundee Technical College, at a cost of £300, has been accepted.

Hounslow.—The D.C. has placed an order with Messrs. Babcock & Wilcox, Ltd., at £310, for a mechanical chain grate stoker.

London.—L.C.C.—The Highways Committee received the following tenders for roadwork and platelaying, exclusive of rails and special trackwork, in connection with the construction, on the underground conduit system, of tramways along the Victoria Embankment east of John Carpenter Street, Blackfriars Road, and Southwark Street:—

R. C. Brebner & Co. (recom.)	£11,420	W. Manders	£13,599
Dick, Kerr & Co.	13,055	J. Mowlem & Co.	14,767
A. N. Coles	12,945		

Chief engineer's estimate .. £11,953

Messrs. W. T. Henley's Telegraph Works Co. are to receive the contract for low-tension cables required in the reconstruction of the Cambridge Road tramways, at a reduction of 1½ per cent. on the prices in their existing cable contract. The total is estimated at £2,750.

Messrs. Hadfield's Steel Foundry Co., Ltd., are to supply a junction and cross-over in connection with the tramway tracks leading into the Greenwich Road permanent way tramways depôt, at £515.

STEPNEY.—The result of the tenders for demand indicators for the next two years is as below:—

Chamberlain & Hookham, Ltd. (not complying with specification)	£311
Engineering Instruments, Ltd. .. .. (no sample)	400
B.I. & Helsby Cables, Ltd. .. (not complying with specification)	405
Reason Manufacturing Co. .. .. (recommended)	563
Electrical Co. .. .. (no sample)	1,669
General Electric Co. (combined meter and demand indicator; meter not complying with specification)	2,397

For time switches for a like period the following tendered:—

Reason Manufacturing Co.	£559
Venner & Co. .. .. (recommended)	813

WANDSWORTH.—An error crept into our last week's table of the tenders for the electric lighting and bell work at Putney Secondary School. The price quoted by Messrs. Tilley Bros. was £723, not £523.

MARYLEBONE.—The B.C. has accepted the tender of Cory & Son, Ltd., for the supply of 10,000 tons of coal to the electricity undertaking in the New Year, at 10s. 11d. per ton.

Margate.—The T.C. has accepted the tender of Messrs. Stuart & Moore for electrical fire alarm apparatus, at £68.

Middlesex.—The County Council on June 24th placed an order with Messrs. Dick, Kerr & Co., Ltd., for the construction, at an estimated cost of £45,500, of the Southbury Road, Enfield, tramway (Railway No. 4, Order, 1906). The work is to be done on the contract price on which the firm are constructing the Regent's Park Road, Ballards Lane, &c., and the Cricklewood Lane tramways.

Southampton.—The T.C. has accepted the tender of Messrs. P. Brotherhood, Ltd., at £60, for an air compressor for the tramways department.

The T.C. has received the following tenders for the supply of cable:—

I. Frankenburg & Sons.—(*a*) 3,000 yards 1·0 sq. in. single-conductor cable (1) lead-covered —, (2) non lead-covered £1,770; (*b*) 1,500 yards 0·5 sq. in. single-conductor cable (3) lead-covered —, (4) non lead-covered £465.
W. T. Glover & Co. (accepted for *a* and *b*).—(*a*) (1) £1,826, (2) £1,794; (*b*) (3) £484, (4) £471.
St. Helens Cable and Rubber Co.—(*a*) (1) £1,862, (2) £1,817; (*b*) (3) £503, (4) £477.
Johnson & Phillips, Ltd.—(*a*) (1) £1,850, (2) £1,820; (*b*) (3) £490, (4) £476.
W. T. Henley's Telegraph Works Co.—(*a*) (1) £1,850, (2) £1,825; (*b*) (3) £493, (4) £477.
Western Electric Co.—(*a*) (1) £1,847, (2) £1,828; (*b*) (3) £491, (4) £478.
British Insulated and Helsby Cables, Ltd.—(*a*) (1) £1,853, (2) £1,830; (*b*) (3) £492, (4) £480.
Siemens Bros. & Co.—(*a*) (1) £1,873, (2) £1,840; (*b*) (3) £495, (4) £484.
Callender's Cable and Construction Co.—(*a*) (1) £1,950, (2) £1,900; (*b*) (3) £540, (4) £530.
Craigpark Electric Cable Co.—(*a*) (2) £2,200; (*b*) (4) £480.
New Gutta-Percha Co.—(*a*) (2) £3,180; (*b*) (4) £843.

Walsall.—The T.C. has accepted the tender of Messrs. Doulton & Co., Ltd., for 1,000 yd. of stonework troughing, at 5d. per yard.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, July 2nd. At 7.30 p.m. Visit to the engineering workshops and laboratories of the East London College.

NOTES.

Electricity Works Table.—We are informed that the voltage given in our table for Eltham (200 v.) under the heading "London—Woolwich, Plumstead and Eltham," is incorrect; the supply voltage there is 220 volts.

The Eight-Hours Act.—July 1st, 1909, is a day fraught with grave consequence to the mining industry, and indirectly to all the great manufactures of this country. It witnesses the coming into force of an Act which embodies a new principle, namely, control by the State of the number of hours which a grown man may do in a day. If an eight-hours day is prescribed for the miner, who shall say that it may not, in future years, be made unlawful for any artisan to exceed this "time limit"? We have grave misgivings as to the results of this class of legislation. Signs are not wanting that this very measure is likely to strain the relations of miners and employers, and there are certain remoter consequences which may be looked for. Let us glance at the text of the measure, which is now in force elsewhere than in the Counties of Durham and Northumberland. Sec. 1 (1) provides that, "Subject to the provisions of this Act, a workman shall not be below ground in a mine for the purpose of his work and of going to and from his work, for more than eight hours during any consecutive 24 hours. Then follows Sub-sec. (2), which enacts certain limitations to the application of the principal section, with the result that it is not intended to enforce a hard-and-fast eight-hours day. Sub-sec. (2) provides for overtime to be worked under certain circumstances, which are enumerated. It appears to amount to this—that the section will not be held to be contravened in cases where workmen are kept underground beyond the time limit if they are so detained to meet an emergency such as accident, danger, apprehended danger, or work requiring to be completed before the ordinary work in the mine can be resumed, which had required more time to complete than was foreseen. Sec. 1 also provides for a "shift" of workmen—that is, a body of men whose hours for beginning and terminating work in the mine are approximately the same. In such a case the legal period underground counts from the time the last workman in the "shift" leaves the surface up to the time the first workman in the "shift" returns to the surface. Later in the same section (Sub-sec. 4) it is provided that the periods of time occupied in lowering and raising a "shift" must have the approval of the Inspectors of the district. By Sec. 1 (7) (*a*) foremen, examiners, deputies, pump minders, onsetters, fanmen or furnacemen are entitled to be under ground 9½ hours, and apparently these men, or any of them, may be employed overtime like the regular miners. Subject to what has been said, there are but two sections which apply to relieve the employer from the rigour of this extraordinary statute. In the first place, an addition of one hour may be made to the working day on 60 days in the year. Again, in time of war, grave national peril or industrial disturbance, the King may, by Order in Council, suspend the operation of the Act for such period as he thinks fit.

Electrical Football League. — A special general meeting is being held on Wednesday, July 14th, at 7 p.m., in the offices of the St. James's and Pall Mall Electric Supply Co., Ltd. The last day for receiving applications from those clubs who intend joining, is Monday, July 12th. The hon. sec., Mr. J. W. Fraser, 39, Wearside Road, Lewisham, S.E., will be pleased to give any information required.

Cricket.—Aberdeen Corporation electricity department employés' cricket eleven met St. Williams C.C., and defeated them by 23 runs.

Morrison v. British Aluminium Co, Ltd.—In the Chancery Division on Tuesday, Mr. Cave, K.C., M.P., applied to Mr. Justice Warrington that Mr. A. W. Tait, C.A., be appointed receiver and manager of the company on behalf of the debenture stock-holders. The company, he said, was incorporated in 1894, and had a capital of over a million. Of its debenture stock, amounting to a million, £300,000 was reserved to pay off a Loch Leven security. The plaintiffs were the executors of the late Mr. Charles Morrison, and held £175,000. A great part of the company's property was the entire share issue of the Loch Leven Electric Co. The company had made large sales of aluminium, but the position at the present moment was one of considerable jeopardy for the holders of the large issue of stock. The company had endorsed bills amounting to £100,000, which were due that day, and had also borrowed from bankers, who were pressing for the reduction of the loan. Mr. H. E. Wright, for the company, said it did not offer any opposition to the application. The company had been very successful in the past, and it was hoped that with further working capital it would be even more successful in the future. The appointment was asked for in order to facilitate the reconstruction of the company. His Lordship appointed Mr. Tait receiver and manager, the managership not to extend beyond October 31st.

The Electrical Engineers' London Division (Territorial Force).—A good many members of the Corps were competing at the Stadium, Shepherd's Bush, in the Territorial Force Athletic, Swimming and Cycling Championships, on June 20th, and had the satisfaction of getting second in the grand aggregate for the £200 Challenge Trophy, just missing being the winners by one point, and beating the London Scottish by one point. Nine prizes were won by the Corps, as follows:—

High Jump Championship.—Sapper C. J. R. Stewart, 2nd Prize.
Quarter Mile Cycling Championship.—Sapper W. E. Cox, 3rd Prize; Second Corporal J. Roden, 6th Prize.
Five-Mile Cycling Championship.—Sapper W. E. Cox, 3rd Prize; Sapper A. E. Argent, 5th Prize.
110 Yards Swimming Championship.—Sapper A. J. Monk, 3rd Prize; Sapper A. R. Frazer, 6th Prize.
440 Yards Swimming Championship.—Sapper A. J. C. Williams, 3rd Prize.
120 Yards Hurdle Championship.—Corporal F. G. Engholm, 4th Prize.

Electric Shock Fatalities.—It is reported that on 24th ult., while John Smith, of Armley, was employed by the Leeds Forge Co. erecting an electric crane, he accidentally put his arm upon a live wire, which immediately ignited his clothing. It was found that death had been instantaneous.

It is also stated that Samuel Higgs and Daniel Eyre, miners, were killed by electric shock on 28th ult. at the Clifton Colliery, Nottingham, where they were working upon an electric coal-cutting machine. Eyre, the motor driver, discovered that there was something wrong with the machine. He pulled the starting lever, but immediately fell to the ground lifeless. Higgs, who, it is said, was not touching the machine, was next seen to fall backwards. His face was badly bruised, but when comrades went to his assistance, it was found that he was still breathing. Artificial respiration was tried, but without avail.

Manchester Engineering Dispute Settled.—According to the *Financial Times*, the wages dispute in the Manchester and district engineering trade was amicably settled on 24th ult. Masters' and men's representatives met in conference to consider the proposed reduction of 1s. per week in time rates and 2½ per cent. on piece rates. It was ultimately agreed to recommend that the present rate of wages should remain undisturbed for a period of five years from July, and that any subsequent alteration should be subject to two months' notice.

Annual Sports.—Portsmouth Corporation Tramways Social and Athletic Society held their second annual sports meeting on Wednesday last week, when they carried through a long programme of over forty events. Our correspondent says that the racing was of a high order, and the events were keenly contested. The chairman of the Committee was Mr. W. R. Spaven, the manager of the tramways; Mr. V. G. Lironi was vice-president, and the hon. sports secretary was Mr. P. H. Roscoe. One of the most popular events of the afternoon was the tug-of-war between police and tramwaymen, in which the first-named proved to be unpopular with the public.

Appointments Vacant.—Switchboard attendant for Stockton-on-Tees electricity works (27s. 6d.); Electrical engineer as manager of the Pontypool electric light and power station (£125); Tramways clerk for Rawtenstall (25s.). See our "Official Notices" to-day.

Fair Wages Clauses.—A committee has been appointed to advise the Departments of Government with a view to promoting uniformity of administration and co-operation between Departments in dealing with the Fair Wages Clauses of Government contracts.

National Electrical Manufacturers' Association (Inc.).—A committee meeting of this Association will be held at the offices, Balfour House, Finsbury Pavement, E.C., on Tuesday, July 13th, at 2.30 p.m.

Institution and Lecture Notes.—THE IRON AND STEEL INSTITUTE.—The autumn meeting will be held in London from Monday to Thursday, September 27th to October 1st. The mornings of Tuesday and Wednesday will be devoted to the reading and discussion of papers at the Institution of Civil Engineers, Great George Street, Westminster. The afternoons of Tuesday and Wednesday will be devoted to visits to works and to places of interest in and around the metropolis. These visits will include the Royal Arsenal, Woolwich; the works of Messrs. Siemens Bros., Woolwich; the generating station of the L.C.C. at Greenwich; the works of Messrs. Fraser & Chalmers, Ltd., Erith; the Lambeth Potteries of Messrs. Doulton & Co., Ltd., and the motor-car works of Messrs. Napier & Son, Ltd., Acton. A visit will also be arranged to the Royal Small Arms Factory at Enfield and to the National Physical Laboratory, Teddington. On Thursday afternoon the Lord Mayor and the Lady Mayoress will hold a reception at the Mansion House. There will also be visits to the Mint, to the Halls of several of the City Companies, and to the places of interest in the City. On Friday, October 1st, it is hoped to arrange an excursion to Portsmouth, to visit any men-of-war that may be there on that day.

INSTITUTION OF MINING ELECTRICAL ENGINEERS.—At a meeting on Saturday last, held in Newcastle, it was decided to form a local centre of the Institution. Mr. H. J. Fisher, Burn House, Shiney Row, Fence Houses, Durham, is honorary secretary *pro. tem.*

The formation of a branch in Scotland is projected, and a meeting for this purpose will take place on Saturday, July 3rd, at 7 p.m., at the offices of the Institution of Engineers and Shipbuilders in Scotland, Elmbank Street, Glasgow.

MINING STUDENTS' ASSOCIATION.—Prof. F. G. Baily recently lectured on the dangers to be guarded against when electricity was employed in coal mines, and suggested that the men

responsible for the safety of mines, both managers and inspectors, should have a more exhaustive training in all parts of the knowledge they were supposed to possess, that they should be paid more liberally, and that facilities should be afforded for the testing of electrical mining plant under realistic conditions.

Conversaziones.—On Wednesday evening the annual Conversazione of the Institution of Electrical Engineers took place at the Natural History Museum. We shall refer to it more fully next week. On the previous evening the Royal Society of Arts Conversazione was held at the same place, Sir W. H. White receiving the guests.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. J. A. Hamp, charge electrical engineer at the Metropolitan Railway Co.'s Neasden power station, was presented by the staff, on June 23rd, with a cabin trunk, as a token of esteem, the occasion being Mr. Hamp's departure from Neasden to Brazil, to take up the position of chief electrical engineer to the San Paulo Railway Co.

Tramway Officials.—Mr. H. E. Blain, tramways manager of West Ham, was voted an increase in salary of £100, to be followed by two subsequent annual increments of £50 each, at the meeting of the West Ham Council held on the 22nd inst.

General.—We learn that Mr. Henry W. Bowden, M.Inst.C.E., M.I.E.E., after about 18 years as managing and chief engineer of the Brompton and Kensington Electric Supply Co., Ltd., is resigning that office, and is accepting the position of consulting engineer to the company—a more or less permanent appointment. Eighteen years is a long time to look back over in connection with London electricity supply, but it is within our recollection that when Mr. Bowden took charge of this undertaking the £5 shares were being bought for a very low figure indeed by those who believed in the future of the company and in Mr. Bowden's management thereof: and since then the company has made good progress and achieved excellent results. It will, no doubt, be satisfactory to the shareholders to know that Mr. Bowden's intimate knowledge of the company's affairs is to be retained under the above arrangement. Mr. Down will take up the management (dating from July 1st), and for a time he and Mr. Bowden will act more or less in co-operation. Mr. Down will zealously devote himself to winning the new consumer by the aid of the metal-filament lamp, and in other ways. Our readers are aware that Mr. Bowden is also actively interested in the South Metropolitan Electric Light and Power Co., Ltd., and in the Woking Electric Supply Co. The South Metropolitan Co. has had an uphill fight, and although there may be a temporary fall in revenue owing to the on-coming of metal-filament lamps, the concern has a good future before it, and more particularly so if it can succeed in tapping the small consumer—a class of resident that is very largely in evidence in its area. The company has already made an interesting and enterprising beginning in this direction by taking a house in Springbank Road, close to Hither Green Railway Station and fitting it up with a model installation, wiring and furnishing it suitably for the resident paying, say, from £35 to £40 per annum rental. The South Metropolitan already claims third position among the London companies for low costs, with an output of rather less than one-fourth of that of its competitors, and if it can succeed in tapping this large source of revenue it will greatly improve upon that position. We are asked to state that all communications for Mr. Bowden should be addressed to him at 30, Craven Street, Strand, W.C.

The Worcester City Education Committee has appointed Mr. C. E. Abell as instructor in electric lighting at the Art, Science and Technical Schools; and Mr. F. W. Coomber as instructor in electric wiring.

The Watford D.C. has increased the salary of Mr. C. S. Taylor, mains superintendent, from £95 to £110, rising to a maximum of £130 by annual increments of £10; Mr. G. A. Ayre, shift engineer, has been placed on the same scale as the other two engineers, viz., £90, rising to £100 by annual increments of £5.

On Saturday last, the 26th ult., a pleasant function took place at the Victoria Hotel, Manchester. A meeting was held of the district managers of the Edison & Swan United Electric Light Co., Ltd., for the purpose of presenting a testimonial to Mr. O. H. Bishop, sales manager to the company, who has resigned after 18 years' service in order to take up other duties. The presentation took the form of an illuminated address and a service of silver subscribed for by the whole of the district managers and the heads of departments of the Northern works of the company. During the same week Mr. Bishop was presented with a gold cigarette case and an address by the sales department staff, and with a gold-fitted dispatch-case and a gold-mounted letter-case by the heads of departments at the Ponder's End works.

It is announced that in view of his advanced age, Mr. T. E. Vickers, C.B., has resigned the chairmanship and managing directorship of Vickers, Sons & Maxim, Ltd., after services to the company extending over 60 years. Mr. Albert Vickers has been elected chairman of the company, and Lieut. A. Trevor Dawson, R.N., has been appointed managing director.

The Aberdeen staff of the National Telephone Co., Ltd., presented Mr. James Kerr, electrician, with a timepiece on the occasion of his marriage. A pleasant gathering was presided over by Mr. T. Mackenzie, contract manager, and the gift was handed over by Mr. E. E. Stockens, district manager.

Mr. A. Henderson was presented with a chronograph stop-watch and chain by the staff of the electrical department of Messrs. John Brown & Co., Ltd., Clydebank, on the occasion of his leaving to take up the post of electrical engineer to Messrs. Scotts' Shipbuilding and Engineering Co., Ltd., Greenock, Scotland.

Messrs. Kincaid, Waller, Manville & Dawson have removed to St. Stephen's House, Victoria Embankment, owing to the lease of 29, Great George Street, having been acquired by H.M. Office of Works. The firm's telegraphic address and telephone numbers remain unaltered.

NEW COMPANIES REGISTERED.

Power Transmission Syndicate, Ltd. (103,581).—This company was registered on June 18th, with a capital of £40,000 in 39,500 cumulative preferred participating ordinary shares of £1 each, and 10,000 deferred shares of 1s. each, to adopt an agreement with E. Hess Remanda, and to carry on the business of electricians, generators, accumulators, distributors and suppliers of electricity, engineers, proprietors of tramways and railways, omnibuses, motor-cabs, cars, carriages, vans and conveyances of all kinds, &c. The subscribers (with one share each) are:—H. P. Surtees, 43, Bedford Row, W.C., solicitor; A. A. Surtees, 43, Bedford Row, W.C., solicitor; W. Hicks, 5, Oxford Gardens, W., solicitor; F. J. Abbott, 233, Clarence Road, Kentish Town, N.W., clerk; G. L. Devisse, 17, Pembroke Street, King's Cross, N., clerk; R. B. Phillpotts, 4, Bishopsgate Street Within, E.C., solicitor; F. J. White, 481, Lea Bridge Road, Leyton, N.E., clerk. Minimum cash subscription 10 per cent. of the shares offered to the public. The number of directors is not to be less than two or more than ten; the first are W. Scott-Scott and E. Hess Remanda; qualification, 100 shares; remuneration, £50 each per annum (chairman, £100) and 1 per cent. each of the net profits remaining after 7 per cent. has been paid on the preferred participating shares. Registered by Surtees, Phillpotts & Co., 4, Bishopsgate Street Within, E.C.

CITY NOTES.

South Metropolitan Electric Tramways Co., Ltd.

The meeting of the company was held on Monday, at the Federation Offices, Kingsway, Mr. C. G. Tegetmeier presiding. The Chairman, in proposing the adoption of the report, said that both branches of the company's business had been unfavourably affected by the trade depression which had existed for some time past. With regard to the tramway side of the business, as they were aware, the prevailing bad times had affected the majority of tramway undertakings. Their line ran principally through the open country, and was constructed with a view to the future development of the districts. That development had been retarded by the bad times, but it would come sooner or later. The effect of the trade depression was very pronounced on the company's traffic, and that had been accentuated by their having had a disproportionate number of wet week-ends. The result was that the receipts on the tramway undertaking showed an increase of only £470 over those of the previous year. They had actually carried a less number of passengers, but the small increase was due to the average distance travelled being longer. They had effected practical economies in the working where it had been possible. The power and running expenses showed a reduction of £1,392, but on the other hand, the cost of repairs and maintenance, which necessarily tended to increase rather than decline, had gone up by £832. Out of the total amount of £10,017 for power expenses, £8,545 was expended for current purchased. As the shareholders were aware, they were under an obligation to buy in bulk all their current for the working of their trams from the Croydon Corporation and the Beckenham U.D.C., and the price they paid was 2d. per unit in the case of the first-named and fractionally less to Beckenham U.D.C. A saving of many thousands of pounds would be effected if they were able to generate their current at their own power station. As to the electricity supply section of the business, it was satisfactory to find that they had added 202 new customers, representing to their mains an increase of 34 per cent. Unfortunately, that increase of 34 per cent. had only resulted in an increase of 9 per cent. in the amount of current sold. The explanation was to be found in the adoption of the metallic-filament lamp. The lessened individual consumption and the large increase in the number of customers continued to be a marked feature of the company's operation. As an instance, from the March quarter of this year, in spite of an increase of 23 per cent. in the number of their private lighting consumers, the amount of current sold only increased 2 per cent. Turning to the profit and loss account, whilst the balance from the working account of the two branches of the business was £1,192 more than in the previous year, sundry receipts and interest together showed a decrease of £1,591, and on the other side of the accounts the administration and general expenses had increased £1,104. The result was that the net profit for the year amounted to £7,777, as compared with £8,477 last year, and with the £470 brought forward from last year, they had an available balance of £8,208. The payment of the dividend on the preference shares for the first half-year absorbed £4,904, and the directors recommended £3,000 to be placed to depreciation and reserve, thus leaving £304 to be carried forward. They regretted not being able to recommend the payment of a further dividend on the preference shares,

but he was sure the shareholders would fully agree with the conservative policy of the board in strengthening the position of the company.

Mr. Devonshire seconded the motion, and the report was adopted.

J. G. White & Co., Ltd.

Lord Arthur Butler presided at the offices of the company, Cloak Lane, E.C., on Monday over the tenth annual meeting, and in moving the adoption of the report (see Electrical Review, June 25th, page 1057), said the generally adverse business conditions and the very severe competition existing in the construction business had made the company's work difficult, but the figures in the balance-sheet indicated that these difficulties had been satisfactorily met, the profits for the year showing an increase over those at February 28th, 1908. The directors felt, therefore, that the shareholders were to be congratulated upon the results of the year's trading. Taking up the items in the balance-sheet, it would be seen that the item of cash in hand and loans at call against securities was very large. In fact, the cash assets of the company were practically equivalent to the whole preference capital. This was well, in so far as it proved that the assets were liquid, but unsatisfactory in so far as it indicated a reduced turnover. The profit and loss account, however, showed that the company's resources and credit were being employed in a manner which earned satisfactory returns, though not quite what they would do with better general business conditions. The actual cash and call loans of the company were equal to twice the whole indebtedness at the date of the balance-sheet. This indebtedness was entirely in connection with ordinary open accounts, the company having no moneys borrowed. The item of investments now standing at £109,429 15s. 5d. was considerably lower than the corresponding amount in last year's balance-sheet, certain securities having been disposed of in the meantime. He might mention that without exception the securities sold had realised more than the amounts at which they were taken in last year's accounts, thus showing that they had been conservatively valued. The directors believed that the present valuation of securities was equally conservative. The next item of contract retention and work in progress was self-explanatory. All doubtful items had been fully provided for, and this amount of £87,767 14s. 8d. was an asset which would be collected as the maintenance periods of their various contracts ran out, and as contract work was completed, while at the same time corresponding sums were being invested in new construction business. The valuation of plant, material in hand, &c., was nominal, having been taken at practically a scrap value basis, and not at its value to the company in carrying on its ordinary business. The item of goodwill stood at the same figure as last year, but the reserve fund of the company, if they considered favourably the recommendation made to them that day, would be more than double the amount of this item. The debit side of the balance-sheet required no comment beyond saying that the item of sundry creditors, &c., consisted of ordinary trade accounts in connection with the carrying on of the company's business, and the necessary provisions for contingencies. Regarding the future prospects of the company, he might say that business now in hand ensured satisfactory profits for the current year, and negotiations were progressing favourably for the securing of a considerable amount of new work. After deducting the dividends recommended in the report, amounting to 8 per cent. on all classes of shares for the year, the company's reserve fund would stand at £100,000, and the profits carried forward amounted to £15,460, making a total accumulated profit now in the business of £115,460. The directors believed that a conservative policy was in their interests, and that the accumulation of substantial reserves greatly added to the value of their investments.

Mr. J. B. White seconded the motion, and the report was adopted.

Indian Electric Supply and Traction Co., Ltd.

Mr. John G. B. Stone presided on Monday over the annual meeting of this company, held at Orient House, New Broad Street, E.C.

The Chairman, in moving the adoption of the report (see Electrical Review, June 25th, page 1057), expressed the disappointment of the board that better results had not been achieved. The small demand at the commencement of supply was mainly the cause. The recent growth of the business as shown by the percentage of increase expressed in number of lamps connected, was encouraging enough. A good deal of their trouble might be attributed to the compulsory laying of mains through certain areas in the city. A compulsory area might be a not unreasonable condition attaching to a right to supply electricity in this country, but events had proved that it was quite unsuitable in a city like Cawnpore. The enterprise was started with the idea that the supply of current would be readily taken by both Europeans and natives, but the results so far obtained, showed that the people had been very slow to appreciate the advantages of electrical supply, though at last they were experiencing a more rapid increase in demand. As its advantages for power purposes became better appreciated, they might look for a good business being built up among small power-users. As regards the larger power-users, they had secured a footing in two of the large mills, and hoped eventually to obtain the supply of a considerable portion of their motive power. It had been suggested that they should extend their mains to the Cantonments, where they might secure a good demand, but the price at which the military authorities would enter into a contract, did not justify the capital expenditure involved. That was to say, while they might get a return on the new capital outlay, the existing capital would not be benefited. The board had felt that in order to deal with questions arising in Cawnpore, the assistance on the board of someone thoroughly acquainted with the problems of electrical supply, and who at the same time, had some personal knowledge of Cawnpore itself would be beneficial, and he was glad to say they had been fortunate enough to secure Mr. Scott Moncrieff as a director. Mr. Scott Moncrieff had gone thoroughly into the position and prospects, and regarded the development of the supply side of the business only as a matter of time. Unfortunately it would be necessary to raise further money for the purpose of liquidating their debts and for making necessary extensions. For this purpose some proposals were being drawn up for the consideration of the creditors, and a definite scheme when agreed upon would be submitted to the shareholders. The scheme would involve considerable modification of the agreements with the agents and the secretaries, and the spirit in which it had been met was an indication of their desire to sink personal considerations and to make the company a success. The consent of the contractors would also have to be obtained. No underwriting commission was paid on the issue of capital for the company, and the interest on the construction debentures has gone into the pockets of the shareholders themselves. With regard to the tramway, on the advice of the local agents, a very low scale of fares was adopted, the idea being to teach the natives to ride and to popularise the service. The result was to encourage traffic, but the rates were unremunerative. In order to deal with this question, Mr. Pfeiffer, who was the general manager of the Calcutta Tramways for some time, was sent out to report on the situation generally, but more especially on the tramway and the question of fares. He strongly advocated raising the fares, and the board adopted his suggestion. He would like to emphasise the fact that India generally, and the United Provinces particularly, had been passing through a period of great stress, and the population had had very little money to spend. The tremendous drop in the railway earnings generally afforded ample proof of this. Things were reported to be now improving, and they might hope to benefit considerably as the depression passed away. He should add that they had received encouragement and assistance from the Local Government and the municipal authorities of Cawnpore, who were evidently anxious to see the successful development of electrical enterprise in their city. The mail received that morning give the result of the May working, which was a surplus over local costs of Rs. 2,503/14/3 on the supply side of the undertaking, and a deficit of Rs. 827/0/5 on the tramways, which compared with a surplus of Rs. 1,160/2/6 on supply and a deficiency of Rs. 1,301/10/11 on the tramways in May last year, the combined figures showing a surplus this year of Rs. 1,676/13/10, against a deficiency last year of Rs. 141/8/5. They had also received a cable which enabled him to bring down some of the figures given in the report to a later date. Up to June 19th the units delivered to consumers were 95,925 this year, against 52,701 in 1908. The number of lamps connected to the mains on June 19th was 13,700, a further 1,000 were in course of connection, and preliminary inquiries had been received for 3,900 more.

Mr. W. H. Cheetham seconded the motion, and the report was adopted.

Prospectuses. — *Tangkah Rubber Estate, Ltd.* — This company has been offering for subscription an issue of 62,500 6 per cent. preferred participating shares of £1 each. The estate consists of about 11,000 acres, situated in Johore, about 80 miles north of Singapore.

Jong-Landor Rubber Estates, Ltd.—This company is offering for subscription, the list closing to-day, 55,000 shares of £1 each. The company purchases two estates in the State of Perak, comprising 1,294 acres of rubber lands, of which 1,053 acres are under rubber.

Federated (Selangor) Rubber Co.—The report for the year ended March 31st states that the amount of rubber harvested was 59,694 lb., as compared with 23,618 lb. in the previous year, and the average gross price realised per lb. was 4s. 8¾d., against 3s. 7½d. last year. There were 34,072 trees tapped during the year, giving an average of 1¾ lb. per tree. The directors recommend a final dividend of 25 per cent., making 35 per cent. for the year, carrying forward £953.

Barbados Telephone Co., Ltd.—At the half-yearly ordinary general meeting the chairman had only continued progress to report. During the current half-year the increase over the previous half-year in the supply of telephones was 35. The revenue had increased, and the available balance was $4,243, as against $3,778 previously. The dividend declared for the half-year was 4 per cent., and $1,170 was paid to the deposit account, which practically formed the reserve. There were now 705 telephones in use, producing a half-yearly rental of $9,307. Expenditure was $4,233 and maintenance cost another $1,136, leaving the surplus before stated.

Switzerland.—La Société de la Fabrique d'Accumulateurs d'Oerlikon, of Zurich, is declaring a dividend of 20 fr. per share for the last financial year.

La Société Electrique Vevey-Montreux, of Territot, is declaring a dividend of 8 fr. per share for the last financial year.

Turkey.—La Société de Tramways et Eclairage Electriques de Damas reports a profit of £637 for the last financial year.

Italy.—La Societa Italiana di Elettricita Edison, of Milan, is increasing its capital from £600,000 to £720,000.

British Electric Traction Co., Ltd.

THE directors have issued their report for the year ended March 31st, 1909. As on former occasions, they submit various schedules giving particulars of the items appearing in the balance-sheet and profit and loss account, and also schedules showing the business done and dividends paid by the associated companies. In the last annual report reference was made to the formation of the British Electrical Federation for the purpose of enabling the associated companies to obtain various services on a co-operative basis; and a pamphlet setting forth further particulars concerning the companies included in the Federation, accompanies the present report. These various schedules and the particulars mentioned, give to the shareholders full information concerning the company's position and investments.

The subscribed share and debenture capital of the company remains the same as at March 31st, 1908, viz.:—

£1,338,610 in ordinary shares of £10 each.	
£1,614,370 in 6 per cent. cum. pref. shares of £10 each.	
£1,478,653 in 5 per cent. perp. debenture stock.	
£518,236 in 4½ per cent. second debenture stock.	
	£4,949,869

The amount standing at the credit of reserve account is £602,420. In addition, reserves amounting to £59,162 have been made out of profits against loss or depreciation of specific assets. The various associated companies have created depreciation and reserve funds of their own, which amounted at December 31st, 1908 (including balances carried forward), to £1,015,340. The total amount due to creditors at March 31st, 1909, was £65,228, and of this £46,623 was in respect of debenture interest accrued at March 31st, 1909, which has since been paid. Investments and undertakings stand at £5,037,095, and consists of shares and debentures in associated tramway, electricity supply, manufacturing and other companies, consols, and sundry securities and undertakings set out in one of the schedules. It is made up as follows:—

Consols of the par value of £200,000. Standing in the books at ..	£196,374
Debentures in various companies of the par value of £486,147. Standing in the books at	454,942
Shares in various companies of the par value of £4,428,508. Standing in the books at	4,244,211
	£4,895,527
Capital expended at Barrow, Brighton and Mumbles, *less* reserve of £13,800	141,568
	£5,037,095

Investments standing in the books at £2,883,086 were revenue-earning during the past year, and produced an average return of 4·18 per cent. Investments standing in the books at £2,012,441 did not earn any revenue during the year. The amount of sundry debtors and debit balances stands at £473,680, and shows a reduction on the amount at March 31st, 1908. The expenditure on and in connection with the new office building which has been erected for the British Electrical Federation amounts to £36,188. There is a further sum of £3,274 in respect of other buildings and land. Expenditure on Acts of Parliament, &c., stands at £19,641, and represents expenditure on promotion of Acts of Parliament, light railway orders, and other rights and powers, surveys, negotiations, &c., in connection with various schemes, some of which may not be proceeded with. The amount is being written down annually by 20 per cent. The item stock stands at £9,876, and represents the stock of cars on hire to associated companies, electrical equipments, paving setts and general stores. Provision has been made for depreciation. Goodwill stands at £1,000, and is the balance of a larger amount. Furniture stands at £4,120.

The net profit after reserving £12,500 against depreciation of undertakings worked by the company, buildings and freehold land, stock, doubtful debts and expenditure on undertakings not proceeded with, is £130,726, to which must be added the sum of £35,394 brought forward, making a total of £166,119. After deducting the interest on the 5 per cent. debenture stock and the 4½ per cent. debenture stock for the year, amounting to £97,485, there remains a balance of £68,635, out of which a dividend has been paid on the preference shares at the rate of 3 per cent. for the year, amounting to £48,431, leaving a net balance of £20,204, which the directors propose should be carried forward. The full dividend on the 6 per cent. cumulative preference shares of the company has been paid to March 31st, 1908.

The directors regret that the dividends and interest received from the associated companies during the past year show a diminution of £33,332. The decline in profits has been general throughout the country, and is attributed by many of the companies to the severe depression in trade which has prevailed. A few of the undertakings in England and those at Bombay and Auckland, however, show increased takings per route-mile, which are sufficient to increase the average over the whole of the systems. The total number of passengers carried shows a small increase, the route-mileage of lines worked having slightly increased during the year, but the number of passengers carried per route-mile of line has fallen from 662,726 to 654,770. The effect of this decline in the number of passengers per route-mile has been somewhat counteracted by a small increase in the average fare per passenger, which was 1·23d., as against 1·21d. for the previous year. It has been pointed out in previous reports that the average fare per passenger had steadily fallen from 1·38d. in 1901, to 1·21d. in 1907, in which year the directors announced their intention of making every effort to improve the position by increasing fares, shortening fare stages, and eliminating unremunerative services. They are glad to note that their efforts have succeeded in arresting the decline, and that the present year's figure shows a small increase. The general depression in trade has been severely felt by the electrical manufacturing companies. (The annual report of the Brush Co. is quoted as evidence.)

The general charges and expenses of administration again show a material reduction, being £16,868, as compared with £24,186, the reduction on this occasion being mainly the outcome of the formation of the British Electrical Federation. In the last annual report it was stated that the directors were giving consideration to some of the proposals for electrical enterprise submitted to them from countries where the conditions for the investment of capital are more favourable than in this country, and they are glad to say that the prospects of securing such business are encouraging. The company has already secured a substantial participation in a powerful syndicate, which has been formed in association with German and other Continental banks, for the purpose of negotiating with the municipality of St. Petersburg for a concession of tramways in that city. Other negotiations are pending in regard to various enterprises abroad.

The Poole undertaking in which the company was largely interested, was purchased by the Bournemouth Corporation under an agreement which provided that the purchase price should be settled by arbitration, on the basis of fair market value as a going concern, and that in addition to such price the Corporation should pay certain liabilities of the company. In regard to the latter items litigation arose and, although the Court of Appeal had given a unanimous decision in favour of the company, the Corporation appealed to the House of Lords. The litigation has recently been concluded by the decision of the House of Lords in favour of the company on all points, and in the result the shareholders of the Poole Co. will have received a return of their capital in full, together with a premium. While it is not possible to draw from this a general conclusion applicable to the undertakings of the associated companies, the directors consider that this result affords some indication of the value of a successful tramway undertaking when sold upon an equitable basis.

The directors deeply regret the loss by death of their colleague the Right Hon. H. O. Arnold Forster, M.P. The Hon. Arthur Stanley, M.P., accepted the invitation of the directors to fill the vacancy, but immediately afterwards resigned his seat at the board, pending the determination of a business in which he has conflicting interests. The directors who retire this year are Mr. J. S. Raworth and Mr. P. Debell Tuckett, who, being eligible, offer themselves for re-election.

Birmingham and Midland Tramways, Ltd.

THE report of the directors for the year ending December 31st, 1908, states that the total revenue from all sources was £97,004, compared with £83,838 for the preceding year. The expenses amounted to £45,640 compared with £38,653 for 1907. After providing for all expenses chargeable to revenue, including sums payable to corporations, repairs and maintenance, placing £1,500 to renewals account, and adding the £83 brought forward, there remained £49,948 from which must be deducted—interest on loans £10,429, interest on debenture stock £15,588, dividend for the year on 5½ per cent. preference shares £11,538, leaving a balance of £12,392, which the directors proposed to apply as follows:—Placed to debenture redemption fund £3,550, dividend on the preferred ordinary shares at the rate of 2½ per cent. for the year ended December 31st, 1908, £8,750, carrying to next account £92. The gross receipts from the tramways amounted to £45,826, compared with £44,751 in 1907. The gross receipts from the lighting and power departments amounted to £14,961, an increase of £6,658. The expenses were £9,223, an increase of £3,972. The interest and dividends received from investments produced £33,551, compared with £26,338 for 1907. The total expenditure on capital account during the year on the tramway undertaking was £1,054, and on the lighting undertaking £11,002. Generating plant, &c., valued at £1,527 was transferred from the tramway undertaking to the lighting undertaking, and electrical plant, cables, &c., in Oldbury, valued at £7,181, were sold to the Shropshire, Worcestershire and Staffordshire Electric Power Co.

As foreshadowed in the last report, the company acquired a controlling interest in the Shropshire Power Co. at the beginning of last year, and subscribed for 57,312 shares of £5 each in that company. This subscription was made to enable the Shropshire Power Co. to comply with the provisions of its Acts of Parliament. The money will be gradually required by the Shropshire Power Co. to purchase generating stations and generally to develop its business, but pending the purchase of properties forming part of the company's electric light and power undertaking, the funds not required by the Shropshire Power Co. have been deposited at interest with the company. With the consent of the debenture trustees, the Smethwick power station has been withdrawn from the specifically mortgaged premises, and 25,152 shares of £5 each of the Shropshire Power Co. have been substituted, and the station will be sold to the power company as soon as the necessary legal preliminaries have been arranged. In accordance with the trust deed, a sum equal to 1 per cent. on the debenture stock issued, together with interest on the stock purchased and cancelled, was paid to the trustees in July last, and was applied by them in the purchase and cancellation of £4 100 of stock. The total amount of debenture stock now outstanding is £344,357. An agreement has been entered into with the Corporation of Dudley which provides for the payment of the purchase money by the Corporation, £10,631, on fixed alternative dates during the present year with interest from January 1st last to the date of payment at the rate of 4½ per cent. per annum. The terms of the lease have been agreed, and a Bill in Parliament is being promoted by the Corporation in the present session to empower the Corporation to grant a lease to the company of the tramways purchased for 30 years from January 1st, 1909.

The supply of current to power and lighting consumers has developed satisfactorily. The comparison at December 31st, 1908, in the equivalent of 8-C.P. lamps was as follows:—

	1906.	1907.	1908.
Lighting	3,940	8,437	9,891
Power	8,956	18,326	75,690
Tramways (approximate) ..	25,000	25,000	28,888
	37,896	51,763	113,784

In order to provide for the increased demand on the power station anticipated next winter, it has become necessary to order a 2,000-KW. turbine set for delivery in the autumn. The supply for the consumers in the district of Oldbury is now sold in bulk to the Shropshire Co. at the Smethwick boundary, and is distributed by that company. The introduction and extensive adoption of metallic-filament lamps has temporarily checked the rapid increase

in the supply for lighting, but notwithstanding this, the actual increase is about 15 per cent. over the previous year. Unforeseen delays have occurred in completing the arrangements for the transfer to the Shropshire Power Co. of the electric light and power supply business of the company in consequence of its having been found necessary to apply to the Board of Trade for a new provisional order authorising the transfer of the Smethwick Electric Lighting Order. A new order will therefore be applied for, but cannot be granted until August of next year, before which it will not be possible to complete the proposed arrangements.

The working of the company's undertaking by the Birmingham and Midland Tramways Joint Committee continues to show satisfactory results, and the arrangements have been further continued.

The registered offices of the company have been removed to Electrical Federation Offices, Kingsway, London, W.C.

Owing to pressure of other engagements Sir Ernest Spencer resigned his seat on the board of the company, and Mr. W. G. Bond has been appointed to fill the vacancy.

The report contains extracts from the reports of the associated companies.

Tramways.

	Year ended Dec. 31st, 1907.	Year ended. Dec. 31st, 1908.
Miles open—Route miles	12·10	12·10
Single line	5·41	5·41
Double line	6·69	6·69
Passengers carried	10,732,605	11,006,985
Average receipts per passenger	·99d.	·99d.
Average expenditure per passenger (apart from rent of line, &c.)	·65d.	·69d.
Proportion of expenses to receipts	65 %	69 %
Cars in stock	58	58

Smethwick Power Station.—The following is a statement of electricity generated, sold, &c., for 12 months ending December, 1908:—

Units generated	6,202,898
Quantity sold.—Traction section	1,492,760
Private consumers by meter	3,602,884
Total sold	5,095,594
Used on works	382,004
Total accounted for	5,477,598
Not accounted for	724 990
Total maximum supply demanded	2,000 kw.

The meeting was held on Tuesday last week at the Electrical Federation offices, Kingsway, Mr. J. A. Lycett, the managing director, presiding, in the absence of the chairman, Mr. C. S. B. Hilton, who is in Canada.

In proposing the adoption of the above report, the Chairman said the year had not been one of many changes, and little of striking interest had transpired. In the balance-sheet they would notice that a further amount of debenture stock had been redeemed and cancelled under the trust deed, so that their liabilities were steadily diminishing. Under the item of loans against securities, there was a large increase, which was accounted for in whole by the loan from the Shropshire Power Co. At the meeting last year it was explained that the directors considered it would be in the interests of the company to acquire a controlling interest in the Shropshire Power Co., and they had since bought and paid for 57,312 shares of £5 each. Owing to delays which, from various unavoidable causes, had occurred in the transfer of the Smethwick power house to that company, and in other directions, the Shropshire Co. did not require all its funds, and deposited them with their company. Meanwhile, the dividends received balanced the interest paid within a small sum; and as the Shropshire Co. gradually increased its business, that loan would be gradually reduced. Turning to the other side of the account, the item of discount in respect of debenture interest was shown separately for the first time in accordance with the provisions of the new Act, and there was also an increase under the head of investments, which was accounted for by the investment in the Shropshire Power Co. Amongst the investments to which the auditors had drawn special attention was that in the Birmingham and Midland Motor-Omnibus Co., which caused continued anxiety to the directors. The motor-'bus business had been unfortunate and did not pay, especially in face of the Corporation's electric tramway system. However, it was considered best to carry on the service, particularly where there was no direct tramway competition, rather than to dispose of the assets at a disadvantage at the present time. On the whole, they might take it that the financial position of the company was sound and strong. Coming to the working accounts, the lighting section showed a very satisfactory increase of about £6,600, while the expenses had increased only by £4,000, leaving a net increase of £2,600 to transfer to profit and loss, a result on which they might fairly congratulate themselves. In the traction section the working account showed that they had rather more than held their own with an increase of £960, but the expenses owing to a fuller service and the increase of rates, taxes, &c., had increased by £2,713, the net result being that about £400 less was transferred to profit and loss—not an altogether satisfactory result, but one of which during a year of unprecedented trade depression they must not complain. Coming to profit and loss, while the balance from the working accounts showed an increase of £2,300, sundry receipts had declined by £1,780, leaving a net increase on all accounts of about £500. Their investments had increased by nearly £7,000, due to the dividends received for the first time from the Shrophire Co. That increase would have been in round figures £10,000, the full dividend on the Shropshire shares, had it not been for the lower dividends received from the following companies: The Wolverhampton tramways had only paid 1 per cent., against 1½ per cent. in the previous years, which represented a loss to the company of about £800. The Dudley, Stourbridge and District Electric Traction Co. had only paid 4 per cent., as against 5 per cent., representing a loss of about £988; the South Staffordshire (Lessee) Co. had paid no dividend on the preference shares, whereas last year it paid 3 per cent., which represented a loss to them of £1,194. Altogether the total shrinkage in their investments represented a sum of £2,982. On the other side, rates and taxes had increased by £1,200, and interest by £10,429, due to the loan from the Shropshire Co., which appeared for the first time. To sum up there was a balance of £23,846 transferred to the balance sheet, against £27,919 last year, the decrease being almost entirely due to the decreased dividends received from the subsidiary companies in which they had large interests. The directors this year could only recommend a dividend at the rate of 2½ per cent. The capital account during the past year showed only a moderate increase of £1,054 on the tramway side and £11,002 on the lighting. The accounts showed that that expenditure had been more than justified, and during the current year further development in the lighting business would demand further capital expenditure, all of which, it was expected, would be revenue-bearing at an early date. The Smethwick station sale had not yet been completed, for reasons stated in the report. Generally, although no great improvement could be expected in the near future, the outlook was not without promise of better times. The development on the lighting side was very marked, and promised well, although the difficulty of maintaining prices on which they could live was very great.

Mr. S. R. Blundstone seconded the resolution, and the report was adopted.

The Paris Metropolitan Railway.

The report of the directors of the Compagnie du Chemin de Fer Métropolitan de Paris refers, as usual, first, to the tunnel and other constructional works carried out by the city authorities on the three networks during the year 1908; and secondly, to the works executed by the company, and comprising permanent way and stations, generating station and sub-stations, distribution of power, workshops and operations on the lines already in service. After mentioning that the 10 ventilating works, which consist of bays in the station upper floors or piers, were carried out in the year, it is stated that a mechanical stairway on the Hocquart system had been established at the exchange station of Père-la-Chaise, and a vertical lift is in course of construction at the exchange station of the Place de la Republique. The experiments made with mechanical ventilating apparatus, notably near the Station des Ternes on No. 2 line, had not yielded the results which had been expected. On the other hand, the ventilation of the underground tunnels by means of bays, which give both light and air, appeared to be much more efficacious, and the company's efforts were all directed to this method. The length of line open to traffic, increased from 28 miles at the beginning of the year, to 32 miles on April 21st, when the trunk from the Porte de Clignancourt to Châtelet was started, and this mileage remained unchanged during the rest of the year. The accounts for the past two years include the following items:—

	1908.	1907.
Share capital	£3,000,000	£3,000,000
Bond capital	1,890,000	1,890,000
Total receipts	1,626,400	1,387,200
Working expenses	683,400	598,200
Municipal share in gross receipts	530,700	449,000
Net profits	357,609	340,000
Dividend, per cent.	8	7½
Number of tickets issued	229,700,519	194,823,282

The company's rolling stock at the end of 1908, comprised 488 motor-coaches and 463 trailers, as compared with 365 and 415 respectively at the close of 1907, and an additional 128 motor-coaches and 74 trailers have been ordered and are in course of construction. All grades of employés increased from 3,630 on December 31st, 1907, to 4,114 on the same date in 1908, and the system of granting bonuses to the various classes for the good management of the railway was maintained and developed during the year. The amount paid in this way was £19,800, or £3,320 in excess of that devoted to the same purpose in 1907. In addition to this, the company continued to interest itself in the building of workmen's dwellings for its employés, and at the end of 1908 the total advances reached £19,200, allowing for the erection of 76 houses. The money is lent to the staff and workmen, partly at the rate of 2½ per cent. with repayment to take place in 18 years, and partly at 3 per cent. with redemption in 20 years.

The report proceeds to state that in all probability the year 1909 will witness the completion of the second network for the putting in operation of the metropolitan transversal line from the north to the south, which is, perhaps, the most important, and certainly the most impatiently awaited of the company's lines. It is hoped to open a portion of the third network in 1910, and the whole of it before the end of 1911. The increasing success of the work jointly pursued by the company and the city of Paris had had the double effect of giving rise to local competition, and of inciting the public to demand additional lines, which had been grouped in a supplementary network. The concession had been offered to and accepted by the company, the latter agreeing in return to grant a free interchange of passengers with the network of the Chemin de Fer Electrique Souterrain Nord-Sud. The law declaring the supplementary network of public utility had not yet been passed, but legislative ratification is hoped for before next March. The agreement on the subject of the additional network

has concluded the difficulties which would have arisen from the granting of the concession to a third party, and at the same time it will ensure for the public the advantages of uniformity of the system and of the fares.

The Bombay Electric Supply and Tramways Co., Ltd.

The accounts for the year 1908 record an improvement upon the operations of the company for the year 1907. The Bombay Co. is one of the subsidiaries of the British Electric Traction Co., Ltd., and, of course, is a member of the British Electrical Federation, Ltd., which is also the creation of the B.E.T.

The profit and loss account exhibits a credit balance of £42,474 for the year, after capitalising £2,407, being the proportion of debenture interest paid on unproductive outlay. With the sum of £2,889 brought into the account a total of £45,363 is provided, of which the preference dividend paid and accrued accounts for £35,977, leaving £9,385 to be carried forward to next account. There is thus not anything for the ordinary shareholders. A glance at the balance-sheet, with the terms "Dr." and "Cr.," and the somewhat ill-expressed titles of "Capital Expenditure and other Assets," and "Capital and other Liabilities," leaves an impression that in the first and second items of the former, viz., "Cost of Tramways in Bombay," &c., and "Rights and Concessions," &c., much is desired from the manner in which they are grouped and marshalled. From the present mode of exhibition little is to be learned except the large total which the expenditure has attained. £702 has been written off the suspense account, being the excess of expenses over receipts in the electricity supply department, leaving as an "Asset" or "Capital expenditure" £2,161 odd. As the working account of the electricity supply section shows a gross profit of £7,976, there is no justification for the retention of the balance of the suspense account in the balance-sheet. Of course one knows the usual argument. There is no provision for depreciation; nothing has been written off preliminary expenses, which are apparently hidden in the recesses of "Rights and Concessions," whilst similarly the item of "Cost of Underwriting and Issuing Capital" has received indifferent attention.

Presumably the board will be extinguishing the balance of the horse tramway expenditure account, which appears at a respectable amount, now that electric traction has taken the place of horse traction.

There is but little to note further save that the directors during the present year offered £150,000 5 per cent. second mortgage debentures to bearers for subscription at 94½. There is already £600,000 4½ per cent. debenture stock, so that the debenture account and the preference shares will require for their service in future a yearly sum of £70,500.

The B.E.T. have a peculiar affection for the term perpetuity. In the debenture prospectus, to which reference has been made, it is stated that, "subject to the right of the Municipal Commissioner of Bombay to determine the concession in the event of the company failing to observe certain of the terms thereof, the concession is in perpetuity, save that the municipality, or in the event of the municipality not electing to purchase, the local government, has the right to purchase the combined undertaking on the terms stated at the end of 42 years, 56 years, or 63 years from August 7th, 1905, or at the end of any subsequent period of seven years." A perpetuity means "for ever"—without qualification. Surely there is no perpetuity about the concession.

Marconi's Wireless Telegraph Co., Ltd.

The ordinary general meeting of the above company was held on Monday at River Plate House, Finsbury Circus, E.C., under the chairmanship of Commendatore G. Marconi.

The Chairman, in moving the adoption of the report (see Electrical Review, June 25th, page 1057), explained that he occupied the position owing to the resignation of Sir Charles Euan Smith, the cause of which they all regretted. Since that report was issued the position of the company had continued to rapidly improve. New important orders for stations and plant had been received from the Portuguese and Greek Governments, and the value of orders in hand that day amounted to over £100,000, with every prospect of a very substantial increase in the immediate future. As stated in the report, the trans-Atlantic station at Clifden had been completed, although, unfortunately, owing to the delay of certain manufacturers, a delay of nearly six months occurred. It was, however, a matter of satisfaction to himself to be able to say that the plant had in every way come up to his expectations in regard to efficiency. In regard to the corresponding station at Glace Bay, Canada, the machinery had already been completed, and was now nearly all delivered, and he did not expect that more than a month would be required for its efficient erection. The limited service across the Atlantic which had now been established for over 18 months had continued to give satisfaction to its principal users, but this service, although exceedingly useful to the company, had been very difficult to efficiently maintain whilst additions and alterations were being constantly carried out at the terminal stations. He had no doubt that a very great extension of the trans-Atlantic service might be anticipated as soon as the complete duplication of the station in Canada had taken place, which would enable the company to accept from 15,000 to 20,000 words per day for transmission across the Atlantic, between the stations at Clifden and Glace Bay. The board expected about the end of August to be in a position to invite the Post Office to give effect to their agreement with the Postmaster-General relative to the acceptance and delivery of the company's trans-Atlantic messages at Government telegraph offices throughout the United Kingdom. The board had had to face and overcome arduous tasks and numerous difficulties as a thorough reorganisation of the administration of the company, and of some of the associated companies, was not only desirable but imperative. This, in his opinion, had been so far as possible carried out, and although some of the changes involved a certain expenditure, nevertheless the result had been a considerable saving in current expenses. The board was glad to state that the fear it had once entertained in regard to the ratification of the Berlin Convention by His Majesty's Government being detrimental to the maritime business controlled by the company, had so far not been realised, and a considerable addition had been made to the number of ships carrying the Marconi system. This was an eloquent proof that even under what certain foreign Governments called conditions of open competition, the system controlled by the company had proved able to more than hold its own against other systems, even although these were powerfully assisted by Governments which considered their development a question of national and political importance. The assistance rendered by the company's organisation of wireless telegraphy to the ss. *Slavonia* was still fresh in the memories of all. The two assisting ships, the *Princess Irene* of the North German Lloyd, and the *Batavia* of the Hamburg American Line, were among the ships fitted with the company's system shortly after the accident which resulted in the sinking of the White Star Liner *Republic* in the North Atlantic on January 23rd, on which occasion also the efficiency of wireless telegraphy as worked by the company, was so fully and unquestionably demonstrated. It should be gratifying to the shareholders to know that wireless telegraphy was beginning to be considered every day more and more by the Press and the general public as likely to afford the most efficient and economical method of satisfactory telegraphic communication between the distant parts of the British Empire. Having quoted from an article in the *Times* of June 26th, and referred to the resolutions passed by the Imperial Press Conference, the chairman said that the stations on his system erected by the Italian Government on the Somaliland Coast of Africa had now been completed and were working satisfactorily. The location of those stations being within a few degrees of the Equator was evident proof that no serious difficulty existed in regard to the efficient working of wireless telegraphy to the tropics. Since the last meeting arrangements had been made on satisfactory terms with the Meteorological Offices in London and Hamburg for the supply of weather reports from vessels crossing the Atlantic. Their relations with H.M. Government were now on a most satisfactory basis, and the directors expected that every support would be given by the Government to the development of the company's affairs. Whilst it was an undoubted fact that the complete financial success of the company was dependent on the full working of the trans-Atlantic stations, yet it was also undoubtedly true that a very large measure of success could now be obtained by the execution of orders in hand, which were coming in from all parts of the world. When it was realised that many foreign countries and Colonial possessions were now inclined, for economical reasons, to utilise wireless telegraphy in place of the ordinary wire communication, it was easy to understand what an enormous field existed for the manufacturing branch of the company. In regard to the balance-sheet, the board had every reason to be satisfied with the position of the company, and with the amount of work which had been carried out during the time under review. The directors, after careful consideration, and with the approval of the auditors, agreed that it would be unnecessary and inadvisable, if not misleading, to present a profit and loss account with the balance-sheet for the period ending December 31st, 1908, for the reason stated by the chairman at the last annual general meeting, namely, that pending the completion of the long-distance stations it would be a matter of considerable difficulty to prepare a reliable profit and loss account, on which point there would be a considerable difference of opinion as to the amount to be capitalised. The value of the shares in associated companies should enormously appreciate when the high-power stations across the Atlantic were in full working order, and it was an undoubted fact that those shares were amongst the most valuable assets of the company. Since the issue of the report three influential gentlemen had consented to join the board, viz., Mr. Hammersley Heenan (of Messrs. Heenan & Froude, Ltd., engineers, Manchester and Worcester); Mr. Frederick Whowell (managing director of the Bleachers' Association, Manchester), and Captain H. R. Sankey, R.E. (late director of Messrs. Willans & Robinson). In conclusion, the Chairman expressed his indebtedness to his co-directors for their assistance in the work of the company.

Sir Charles Euan Smith, in seconding the motion, said that the courage, patience and consideration which the shareholders had shown to the board could not be sufficiently appreciated by them. That had enabled the board to meet them from time to time fully confident of the strength of the enterprise in which they were engaged, and to persevere with the work until it was brought to a successful conclusion. The board firmly believed, after all the consideration that had been shown them by the shareholders, that the company was at last within reach of its reward. They sincerely hoped that was the last time they would meet them without promising them a dividend. There were three extremely satisfactory features in connection with the company—the first was the constant and ceaseless expansion of the business in every quarter of the inhabitable globe; the second was the dissipation of the bogey which weighed upon them so long as to the serious results to be expected at the termination of the Berlin convention, and the third was the belief that it would not be long before the Government made it imperative and compulsory on all passenger-going ships to install wireless telegraphy of one form or another. The answer given in

the House of Commons to a question put by Mr. Rees as to whether His Majesty's Government would not consider this a proper time to introduce legislation, was by no means discouraging, and it might be considered, under the circumstances, quite satisfactory. Their chairman had made considerable personal sacrifices to tide them over the worst part of the period they had gone through, and the board were extremely sensible of what he had done for the company, and they hoped he would soon meet with the reward to which his efforts were richly entitled.

Mr. Hammersley Heenan, who had just joined the board, remarked that he thought before long there would be a great fight between the telegraph companies. There were 80 millions of capital invested in cable telegraphs, and he felt perfectly certain that if they made attempts to run wireless telegrams over the world, the directors and shareholders could not take it lying down. One thing the company had to do was to preserve every patent and every secret they had got, in order to maintain their service. He had seen the station in Ireland, and he had no hesitation in saying that a better installation he had never seen. Independent of having the installation up-to-date, and twice as powerful as it need be, they had everything in duplicate. He had been assured by Mr. Marconi that the station on the other side would be as efficiently equipped. As to the cost of the stations, he put them as £50,000 each, which meant a capital outlay of £100,000 for the two stations. The price of an ordinary cable was £1,000,000, and there was a heavy item every year for wear and tear. They had, therefore, with the Marconi system, £100,000 against £1,000,000 to pay dividends on. Taking an instance of their sending 25 words a minute at 3d. a word for 360 days of 24 hours in the year, they would earn £460,000 each way, making close on a million sterling on a £100,000 capital. The profits the shareholders could work out for themselves.

Mr. F. Whowell, another new director, remarked that, when the station began to receive messages from the other side, there would be an enormous future for the company. The station in Ireland was built and fully equipped on the most sound engineering principles.

The resolution was carried unanimously, without a single comment from the shareholders.

"Harper" Electric Piano Co., Ltd.—In the report for the year ended June 1st, it is announced that Mr. C. Martin Hesse, a large shareholder, has accepted a seat on the board. The total net profit, after writing off bad debts and depreciation on fixtures, fittings and lease, and providing for debenture interest, amounts to £967, which, with £980 brought forward, makes £1,947. Interim dividends paid for the two half-years of 1908 on the preference shares at the rate of 10 per cent. per annum absorb £498, leaving £1,448. The directors recommend dividends on the preference shares for the past half-year at the rate of 10 per cent. per annum, and on the deferred shares at the rate of 5 per cent. per annum, leaving £1,149 to carry forward.

Electric and General Investment Co., Ltd.—The report (as quoted in the *Financier*) states that the gross profit on transactions of the year was £11,565. After deducting all general charges and the interim dividend already paid on the preference shares, and providing for the proportion of the final dividend accrued on the preference shares to May 31st, there remained a balance of £4,095. As a further reserve to meet the depreciation in the company's investment and loan securities, the directors have carried this amount to the contingencies fund, thereby raising the amount to the credit thereof to £71,651 as at May 31st. The trustee for the ordinary shares reserve fund proposes to distribute the sum of 6d. per share out of the dividends received on the trust investments. The trustee for the founders' shares reserve fund proposes to distribute the sum of £8 per share out of the dividends received on the trust investments.

W. & T. Avery, Ltd.—A final dividend of 7½ per cent., making 10 per cent. for the year ended March 31st is recommended.

Anglo-Argentine Tramways Co., Ltd.—The directors have declared the following dividends:—

Interim dividend to June 30th in respect of the profits for the first half of the year 1909, at the rate of 8s. per share on the 6 per cent. cumulative first preference shares, being at the rate of 6 per cent. per annum, less income-tax, payable on July 1st.

Dividend of 5s. per share on the cumulative second preference shares, being at the rate of 10 per cent. per annum, less income-tax, payable on July 1st.

Further 2s. 6d. per share on the cumulative third preference shares Nos. 1,080,008 to 1,880,007, being at the rate of 5 per cent. per annum, less tax, and at the rate of 1s. 2·63d. per share on the cumulative third preference shares Nos. 1,880,008 to 1,880,007 (being at the rate of 5 per cent. per annum from April 3rd to June 30th), less tax, payable on July 1st.

Greenwood & Batley, Ltd.—The report for the year ended March 31st last states that, after providing for interest on the debentures and expenses of management and making due provision for doubtful debts, the accounts show a profit of £7,643, which, with the balance at credit of profit and loss at March 31st, 1908, of £5,541, makes £13,094. The directors have written off £4,000 for depreciation, and they recommend that a dividend for the year ended March 31st last be declared at the rate of 7 per cent. per annum on the paid-up cumulative preference share capital, absorbing £7,028, and leaving £2,066 to be carried forward. The directors have also transferred £15,000 from reserve account in reduction of the book value of investments in subsidiary and connected companies.

Globe Telegraph and Trust Co., Ltd.

The meeting of this company was held on Thursday of last week at Electra House, Finsbury Pavement, the Marquis of Tweeddale presiding.

The Chairman, in proposing the adoption of the report, said the accounts showed a slight falling off, as compared with the previous year, but it should be remembered that those accounts were exceptionally good, and indeed were the best they had ever presented to the shareholders since the inception of the company 36 years ago. The receipts for the year, after deducting expenses, amounted to £207,347, against £201,295 last year, or a difference of £2,948. They had already paid to the ordinary shareholders the usual three quarterly dividends and the interim dividends at the fixed rate of 6 per cent. on the preference shares. Those together had absorbed £131,769, and the directors now recommended the payment of a final dividend on the ordinary shares of 5s. 6d. per share net, which, with the previous distributions, made a total dividend for the year on those shares of 5½ per cent., as against 5⅞ per cent. last year. That, together with the final payment of 3s. per share on the preference shares, absorbed £75,479, and left £27,305 to be carried forward to the next account, being £100 more than that carried forward this time last year. Turning to the accounts, they would observe that their receipts from the different companies in which they held investments were, with the exception of four, practically the same as last year. The exceptions were the Direct United States Cable Co., the Great Northern Telegraph Co., the Telegraph Construction and Maintenance Co. and the Western Union Telegraph Co. Their receipts from the Direct United States Cable Co. had fallen off to the extent of £746, their dividend being at the rate of 4½ per cent. this year, as against 4⅞ per cent. last year. The Great Northern Co., in which they had only a small holding, had yielded them about £50 less, their dividend being at the rate of 18 per cent., as against 20 per cent. in the previous year. The Telegraph Construction and Maintenance Co. had also reduced its dividend from 17½ per cent. to 15 per cent., which made a difference to them of £1,094. The receipts from their shares in the Western Union Co. showed a diminution of about £257, their dividend being £2 15s. 10d. per cent., as against £3 8s. 10d. per cent. in the previous year. The losses which the Western Union had suffered were not only due to the general depression in business, but still more to a prolonged and costly strike. That strike was now over, and the prospects of the company had undoubtedly improved, and they might expect better results from that investment during the current year. Having referred to a grant of £250 which the board had made to the widow of the late Registrar, who had been in the service of the company for nearly 40 years, the chairman said that by a rearrangement of the staff a reduction had been made in the yearly charges. The present value of the investments, he stated in conclusion, showed an increase over the original cost of £230,000.

Sir James Pender seconded the motion, and the report was adopted.

Acknowledging a vote of thanks, the Chairman said that no doubt proposals would be made in regard to cheapening rates, but no definite proposition had yet reached the directors. When it did he had no doubt it would receive the consideration which was due to it, and they might rely upon it that the interests, both of the shareholders and the public, would be thoroughly well considered.

Stock Exchange Notices.—The Committee have ordered the following securities to be quoted in the Official List:—

Central Electric Supply Co., Ltd.—Further issue of £63,124 4 per cent. guaranteed debenture stock.

Highlands and Lowlands Para Rubber Co., Ltd.—123,546 shares of £1 each, 15s. paid, Nos. 1 to 7 and 181,462 to 305,000; and 182,952 shares of £1 each, fully paid, Nos. 8 to 181,461 and 305,001 to 306,498.

Bukit Rajah Rubber Co.—For the year ending March 31st the net amount at credit of profit and loss account is £39,278. A final dividend of 31 per cent. is to be paid on the ordinary shares, making 55 per cent. There is to be placed to reserve fund £500, to depreciation £500, and carried forward £1,593.

Vulcan Boiler and General Insurance Co.—The directors have declared an interim dividend of 4s. per share.

Sao Paulo Tramway, Light and Power Co.—The warrants in respect of the quarterly dividend of 2½ per cent. were to be posted on Wednesday.

Eastern Telegraph Co., Ltd.—The directors announce a dividend at the rate of 3½ per cent. per annum, less income-tax, on the preference stock for the quarter ending 30th ult., and a first quarterly interim dividend of 1¼ per cent. on the ordinary stock, free of income-tax, in respect of profits for the year ending December 31st, 1909.

Turbinia German Parsons' Marine.—The report for the past year showed a profit of 241,031 marks. General expenses amounted to 79,278 marks. A dividend of 10 per cent. is recommended on the ordinary, and 8 per cent. on the priority shares. The total number of ships afloat and under construction fitted with turbines of the company's system at the end of April amounted to 273, with 3½ millions horse-power. In conjunction with the firm of Brown, Boveri & Co., the company has acquired an interest in a large German shipbuilding yard.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	£*	No. of wks.	Total to date. £	£*	Route miles open.	Inc.
Aberdeen	June 23	2,840	— 15	3	4,787	— 48	..	..
†Ayr	,, 26	668	— 66	6	1,786	— 124	8	..
Bath	,, 23	1,533	— 23	25	17,503	+ 550	..	..
Belfast	,, 25	7,602	+ 134	12	47,339	+ 1,459	37	..
Birkenhead	,, 27	2,063	— 102	12	13,294	— 453	13·52	..
Birmingham Corp.	,, 19	12,207	—1,375	12	75,405	+ 254	..	..
Blackburn	,, 23	2,189	— 62	13	14,910	— 261	13·97	..
Blackpool-Fleetw'd	,, 26	1,823	— 285	25	10,711	+ 807	..	..
Bolton	,, 27	4,628	— 426	13	30,209	— 553	26	..
Bournemouth	,, 23	3,061	— 57	12	20,132	+ 226	21·96	..
Bradford	,, 12	9,784	— 560	11	57,003	+ 1,358	54·9	..
Brighton	,, 27	1,829	— 27	13	11,865	+ 697	9·5	..
Bristol	,, 25	10,756	+ 763	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	,, 18	444	— 1	24	5,202	— 87	3·65	..
Barnsley	,, 18	303	— 83	,,	3,993	— 143	..	..
Barrow	,, 18	488	— 97	,,	5,154	— 350	5·37	..
Cavehill	,, 18	227	+ 28	,,	1,815	— 154	..	..
Devonport	,, 18	714	— 288	,,	8,828	— 1,725	8·85	..
Gateshead	,, 18	1,915	— 187	,,	23,578	— 48	11·25	..
Gravesend	,, 18	405	— 111	,,	4,617	— 167	6·5	..
Greenock	,, 18	1,259	+ 173	,,	12,180	+ 233	7·25	..
Hartlepool	,, 18	476	— 86	,,	5,140	— 116	6·72	..
Kidderminster	,, 18	191	— 199	,,	2,942	— 137	..	..
Leamington	,, 18	333	— 151	,,	3,769	+ 154	..	..
Merthyr	,, 18	440	— 60	,,	5,524	+ 19	2·9	..
Metropolitan	,, 18	12,318	—1,869	,,	140,696	+12,692	23	..
Middleton	,, 18	814	— 189	,,	7,870	— 446	8·5	..
Mid. Joint Com'tee	,, 18	11,107	—2,789	,,	132,986	— 3,725	..	..
Oldham—Ashton	,, 18	1,150	— 156	,,	13,210	— 898	9·18	..
Peterborough	,, 18	218	— 79	,,	2,577	— 198	5·31	..
Potteries	,, 18	3,330	— 419	,,	42,168	— 1241	29	..
Rothesay	,, 18	605	+ 127	,,	2,585	+ 82	2·75	..
Southport	,, 18	634	— 279	,,	6,239	— 126	8·17	..
S. Metropolitan	,, 18	1,564	— 543	,,	17,879	— 74	..	..
Swansea	,, 18	1,822	— 345	,,	21,894	+ 546	12·5	..
Tynemouth	,, 18	528	— 126	,,	4,171	+ 38	3·75	..
Weston-s-Mare	,, 18	398	— 218	,,	1,863	+ 224	3	..
‡Worcester	,, 18	553	— 167	,,	6,157	— 56	5·75	..
Wrexham	,, 18	188	— 47	,,	2,264	— 90	..	..
Yorks. Wool. Dist.	,, 18	1,770	— 221	,,	21,058	— 425	17	..
Miscellaneous	,, 18	413	— 46	,,	4,646	— 45	..	..
Burnley	,, 26	2,449	— 59	..	..	..	..	..
Burton-on-Trent	,, 27	545	— 2	13	3,366	— 66	6·62	..
Bury	,, 27	2,215	— 378	12½	15,205	— 448	22·6	..
†Cardiff	,, 19	4,283	— 826	12	25,100	— 439	..	..
Carlisle	,, 26	254	— 26	25	3,929	— 110	..	..
Chatham and Dist.	,, 24	1,592	— 70	25	19 118	+ 1,157	14·98	·61
Cork	,, 24	1,029	— 14	25	9,987	— 937	..	..
Croydon	,, 18	2,604	— 631	..	17,210	+ 214	11·25	4·75
Darlington	,, 26	370	— 9	13	2,412	— 150	..	..
Darwen	,, 25	501	— 6	12	3,154	— 105	4·86	..
Dover	,, 19	686	— 77	12	2,304	— 139	4·75	..
Dublin	,, 25	11,273	— 412	..	128,541	+ 395	54·25	..
Dundee	,, 23	2,374	— 57	5½	6,644	— 276	15	..
East Ham	,, 26	2,008	+ 240	12½	12,758	+ 1,955	8·43	·68
Exeter	,, 25	634	— 28	13	4,504	+ 583	5·5	..
Glasgow	,, 26	35,376	—1,939	..	66,783	+ 319	90·5	1·5
Hastings	,, 24	1,976	— 142	..	..	..	..	..
Huddersfield	..	..	..	..	..	..	..	..
Hull	,, 26	4,505	+ 48	12	30,843	+ 162	18	..
Ilkeston	,, 23	204	+ 4	12	1,591	— 137	..	..
Ipswich	,, 26	703	— 12	13	4,841	+ 15	10·5	..
Kilmarnock	,, 19	292	— 2	5	747	— 56	4·26	..
Lan'kshire Trm.Co.	,, 24	2,613	— 106	25	30,379	— 1,856	17·62	1·18
Lancashire United	,, 23	2,614	— 252	25	31,677	— 194	..	..
Leeds	,, 19	13,635	— 558	12	78,204	+ 2,956	96·75	·25
Leicester	,, 26	4,501	— 42	..	..	..	..	..
Leith	,, 19	1,202	+ 143	5	3,117	+ 324	6	..
Liverpool	,, 19	21,257	—1,451	24⅔	253,312	— 2,949	104	..
‡L.C.C.	,, 12	74,358	—1,728	..	876 657	+19.392	121	4·25
London United	,, 26	18,201	—2,148		144,559	—13,025	..	..
Lowestoft	,, 26	352	— 58	39	5,707	— 638	3·5	..
Manchester	,, 26	29,618	—1,548	13	188,994	— 862	90·5	6
Newcastle	,, 26	9,755	— 223	12	50,566	+ 264	..	..
Newport	,, 19	1,280	— 322	12	7,944	— 145	14·5	..
Oldham	,, 26	3,523	— 634	13½	25,792	— 1,676	23·75	..
Pontypridd	,, 26	775	+ 121	12½	5,051	— 886	5·5	1·75
Portsmouth	..	..	..	..	..	..	14·5	..
Preston	,, 23	1,425	— 59	..	..	..	..	..
Rotherham	,, 24	1,184	+ 24	12	7,459	— 170	10	·66
Salford	,, 21	8,822	—2,115	11⅚	54,551	— 1,485	..	..
Sheffield	,, 27	11,202	— 78	12½	75,888	— 1,250	37	1·25
Southampton	,, 23	2,086	— 28	12	12,617	— 353	..	..
†Southend-on-Sea	,, 23	989	+ 101	12	5,627	+ 888	..	..
South Shields	,, 26	1,180	— 182	..	6,985	+ 70	..	..
Swindon	.. ..	..	..	..	..	..	..	..
Tyneside	,, 23	1,698	+ 124	25	11,072	+ 843	..	..
Wallasey	,, 12	2,018	+ 87	10½	9,826	+ 426	..	·22
Walthamstow	,, 26	1,449	— 50	13	8,651	+ 264	9	..
West Ham	,, 17	4,417	— 585	11	26,593	+ 1,766	15	·8
Wolverhampton	,, 24	1,527	— 70	12	9,256	— 598	12·5	..
Baker St.-Waterloo	,, 26	6,760	+ 685	25	83,650	+ 7,470	4·26	..
Cen. London Rly.	,, 26	11,610	—3,226	25	139,113	—17,196	6·32	·55
Char. +, Eus. Hamp.	,, 26	7,900	+1,210	25	97,240	+15,950	7.75	..
City & S. Lon. Rly.	,, 27	6,459	+ 285	25	81,345	+ 1,359	7·8	..
Dublin-Lucan Rly.	,, 25	805	+ 16	25	8,165	+ 253	7	..
G.N. and City Rly.	,, 26	2,703	— 274	25	37,365	— 4,469	8·5	..
G.N., P'y. & Brmin.	,, 26	11,880	+ 690	25	145,115	+ 9,375	9·25	..
L'pool Overh'd Rly.	,, 27	3,839	— 95	25	84,287	— 2,354	6·8	4·3
†Llandudno-Col. Bay	,, 18	638	— 228	29	4,856	+ 1,640	..	..
Mersey Railway	,, 26	3,805	+ 14	25	49,260	+ 1,454	4·5	..
Metropolitan Rly.	,, 27	84,858	+1,327	25	402,202	+18,512	24·5	..
Met. District Rly.	,, 26	21,895	+2,706	25	248,235	+23,911	24	..
Anglo-Argentine	,, 24	77,018	+7,486	25	982,502	+56,595	..	..
§Auckland	,, 18	14,213	+3,180	24	83,101	+11,794	22·3	3·1
Bombay (B.E.T.)	May 27	4,895	+ 204	20	58,704	+ 3,440	..	..
§Brisbane	May	16,551	+1,003	..	..	..	..	..
Calcutta	June 26	6,622	+1,615	..	..	..	..	..
§CapeElectricT.Ld.	..	..	..	..	..	..	..	..
§Kalgoorlie, W.A.	May	3,745	..	..	18,621	..	20·5	..
Madras	June 15	1,140	— 16	23	13,879	— 95	..	..
§Melbourne	..	..	..	..	..	..	..	..
§Lisbon	..	..	..	..	..	..	..	..
Perth (W.A.)	,, 25	2,725	+ 188	..	86,087	+ 904	26	2·4

* Compared with the corresponding period of 1908. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Afternoon.

THE sails of the Stock Exchange ship flap idly, there being barely a breath of breeze to stir them. Only in rubber shares can it be said that anything approaching animation obtains. After being intensely busy for a few weeks, brokers and jobbers chafe at the sudden alteration, and are at some loss to know where to lay the blame. Speculation in mining shares has come to well nigh a full stop, and the consequent fall in prices led to failures. As for investment stocks, prices ought to be good, judging from the condition of the money market; but, in point of fact, Consols are weak, and the general range of better-class stocks—Home Railways excepted—are depressed in sympathy.

Mexico Tramways slumped from 137 to 123½, following upon a drop of 8 points in the week before. The 5 per cent. gold bonds lost 1½. Mexican Light and Power Common shed no more than half a point, but the Preference fell 3½, making 6 in the fortnight. Rio Trams are flat at 83, and Sao Paulo fell to 146½ *ex* dividend.

This further slump in quotations is attributable to financial difficulties of weak holders who were forced to realise. With nothing cheerful in surrounding markets to make the outlook hopeful for the immediate present, prices simply tumbled of their own weight, and were at times marked down without stock changing hands. Whether the time has come for buying Mexican-Canadians yet, we are not in the least disposed to prophesy, but it is in the nature of Stock Exchange prices to rally after any severe and protracted fall. The market in these issues, however, is so nervous and timid now that there might be another swoop down before recovery set in.

Home Railway stocks, as we write, are in a condition of exceedingly subdued hopefulness. The Coal Conference on the Wednesday in this week may alter the complexion of affairs for the worse, but at the moment anticipation leans to the view that an amicable arrangement will be reached, and fears of a strike once more averted. Hence prices are fairly firm, and the only section where this tendency fails to permeate is the luckless "tube" market. Central Londons are distinctly weak, for the Exhibition reason recorded here last week. City and South London also receded, and East London fell back to 3⅜. On the other hand, Metropolitan Consolidated has moved up a little, and Districts keep very firm at 17½, the disreputable weather being humorously hailed as a bull-point. The 4 per cent. Debenture stocks of the Underground Railways group are strong in tone, and the higher figure of the quotation for Bakerloo Debenture is par. London United Tramways Preference continue flat, and the 6 per cent. Income bonds of the Underground Electric Railway are a point lower, although the Prior Lien bonds have regained their slight decline.

The *ex* dividend markings of last account-day included London United Trams 4 per cent. Debenture, the price being put down to 66, British Westinghouse 4 per cent. Debenture, where the quotation was lowered to 40, and Brush Electrical 4½ per cent. Second Debenture, now standing at 29. Upon all of these the interest has been regularly met, so far.

Telegraph and Telephone issues are, on the whole, inclined to dulness. The alterations are small, however, and there is no movement of importance to record. Marconi's regained ⅛ after the meeting of the company. American Telephone and Telegraph recovered half the dividend deducted from the price. National Telephones are not affected by the failure of a Stock Exchange member who used to deal largely in the stocks.

City of London Ordinary and Preference shares show small rises, and Bromptons fell ¼; except for these, the English electricity supply list is featureless. The only other changes are those produced by *ex* dividend markings.

Manufacturing shares show some irregularity. Babcock & Wilcox fell ⅜. British Aluminium Ordinary and 6 per cent. Preference weakened, while the 7 per cent. Preference advanced, only to recede again. Electric Construction Preference rose another 2s. 6d., bringing the price to 1⅛. Willans & Robinson Preference are ⅛ lower. Rubber shares provide the Industrial market with its main attraction at the present time. The Vallambrosa Company has declared a dividend making 80 per cent. for the year, and the continued strength of rubber itself, has led to lively hopes of bumper dividends on other companies' shares. As already observed, the rubber share department is one of the strongest in the Stock Exchange, and stands out with peculiar cheeriness against the background of general drabness colouring most of the other markets.

British Electric Traction Ordinary and Preference fell after the issue of the report. Tramway and Traction shares are quiet, with the exception of the issues already mentioned.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations June 22nd.	Closing Quotations June 29th.	Business done week ended June 29th, 1909. Highest.	Lowest.	Rise + or Fall —	Present Yield per cent.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2¾ — 3½	2¾ — 3½	..	..	..	Nil.
186,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	5 %	5 %	5 %	5 %	94 — 96	94 — 96	..	..	..	£ s. d. 5 4 0
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½%	8 %	8 %	8 %	144 —145	143 —144 xd	..	..	..	5 11 1
$53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	98½—100½	98½—100½	..	..	..	3 19 7
558,460	Anglo-American Telegraph	Stock	32½%	35%	34%	£3 4s.	55 — 58	56 — 58	..	..	..	5 10 1
3,220,770	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	99 —100	99 —100	99¾	99½	..	5 19 8
3,220,770	Do. do. do. Deferred	Stock	½%	1½%	1 %	8/-	15⅝ — 15⅞	15⅝ — 15⅞	16⅛	15⅞	..	2 5 0
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	100½—102½	102 —104	..	..	+1½	4 16 2
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	8 — 8⅛	8 — 8⅛	8⅛	..	..	4 15 6
2,431,350	Commercial Cable, Sling. 500 year 4% Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	90½ — 92½	89 — 91 xd	90½	89	..	4 7 11
16,000	Cuba Telegraph	10	5 %	5 %	6 %	6 %	8⅜ — 8¾	8¼ — 8½	..	..	..	6 15 6
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	17 — 18	17 — 18	..	..	..	5 11 1
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	2⅜ — 3⅜	2⅜ — 3⅜	..	..	..	5 3 9
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8⅜ — 9	8⅜ — 8¾	8⅜	..	— ⅛	5 12 8
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100½—102½	100½—102½	..	..	..	5 15 4
60,710	Direct United States Cable	20	4½%	4½%	4½%	4½%	12⅜ — 13⅛	12⅜ — 13⅛	12⅜	12⅛	..	6 10 0
48,000	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	101 —103	101 —103	..	..	..	4 8 3
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	132 —135	130 —133	135	131	—2	5 5 3
2,000,000	Do. 8½ % Pref. Stock	100	8½%	8½%	8½%	8½%	85½— 87	85 — 87	86¾	85½	— ½	4 0 6
1,896,708	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103 — 105	104 —106	105½	104	+1	3 15 6
800,000	Eastern Extension, Australasia, and China Tele	10	7 %	7 %	7 %	7 %	11⅞ — 12⅛	11⅞ — 12⅛	12⅛	11⅞	..	5 13 3
762,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	102 —104	102 —104	103½	..	..	3 16 11
200,000‡	East. & S. Afric. Tel., 4 % Mt. Db. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	5½%	10⅜— 11½	10½— 10⅝xd	10⅝	10½	..	5 7 0
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13 — 13½	12¾— 13⅜xd	13⅛	..	..	4 9 9
150,000	Great Northern Telegraph, of Copenhagen	10	24%	20 %	20 %	18 %	27 — 28	27 — 28	27¾	..	..	6 8 7
14,800	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	101 —103	101 —103	..	..	..	4 7 5
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	51½— 53½	51½— 53½	..	..	..	6 1 6
$41,380,400	Mackay Companies Common	$100	2 %	3½%	4 %	4 %	80 — 84	80 — 84	..	..	..	4 15 3
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	74 — 79	74 — 79	..	..	..	5 5 3
894,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	⅜— ⅞	⅜— ⅞	15/9	12/9	+ ⅛	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	¾— 1	¾— 1	..	..	..	6 0 0
86,492	Do. do. do. 5 % Pref.	1	5 %	5 %	5 %	5 %	⅞— ⅞	⅞— ⅞	..	..	..	5 13 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	107 —108½	107 —108½	108	107	..	5 10 7
5,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	119½—121½	119½—121½	120⅞	119⅜	..	4 18 9
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½— 11	10½— 11	..	..	..	5 9 1
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	5 %	6 %	6 %	10 — 10⅜	10 — 10⅜	..	..	..	5 11 7
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅞— 5¼	5⅞— 5¼	..	..	..	4 7 2
3,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 —100	97 — 99 xd	..	..	..	3 12 2
1,983,593	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100½—102½	99 —101 xd	99½	..	..	3 19 3
179,813	Oriental Telep. and Elec. 1 to 171,604, fully paid ..	1	7 %	7 %	8 %	8 %	1⅝— 1⅞	1⅝— 1⅞	..	..	..	5 6 8
50,000	Do. do. do. 6 % Cum. Pref.	1	6 %	6 %	6 %	6 %	1⅝— 1⅞	1⅝— 1⅞	..	..	..	5 1 1
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	86 — 88	..	..	—2	4 10 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100½—102½	100½—102½	..	..	..	3 18 1
11,889‡	Reuter's	8	5 %	5 %	5 %	5 %	7⅞— 8⅛	7⅞— 8⅛	7⅞	..	..	4 18 9
145,955	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	100½—102½	98½—100½	..	..	—2	4 9 7
3,042	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	128 —131	128 —131	..	..	..	4 11 7
130,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6½— 7⅛	6½— 7⅛	6⅝	..	..	5 18 8
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5 — 5⅜	4⅞— 5⅛xd	5⅛	..	..	4 18 0
80,008	W. Coast of America, 1 to 80,000 & 58,001 to 63,008	2½	Nil	2½%	2½%	..	1⅛— 1⅜	1⅛— 1⅜	..	..	..	4 10 11
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	4 %	4 %	4 %	4 %	100½—102½	100½—102½	..	..	..	3 18 1
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	13½— 14	13⅝— 13¾xd	13½	13⅜	..	5 0 0
800,000	Do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	102 —104	101 —102	103⅜	100	— 1½	3 18 5
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅛— ⅜	⅛— ⅜	13/16	..	..	Nil
84,568	Do. do. 6 % Cum. 1st Pref.	10	5 %	8 %	6 %	6 %	3½— 3¾	3½— 3¾	..	..	..	6 17 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	15 %	8 — 9	8 — 9	..	..	..	..
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,600	100	5 %	5 %	5 %	5 %	102½—104½	102½—104½	..	..	..	4 15

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,007	5	8 %	8 %	9 %	10 %	9¼— 9⅝	9¼— 9½ xd	9⅝	..	..	5 5 3
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5½%	5½%	5½%	6 %	6½— 6⅝	6 — 6½ xd	6⅛	..	..	4 16 0
978,220	Do. 4 % Deb. Stock	..	..	..	..	..	94 — 96	91 — 92 xd	94½	91½	..	4 6 6
382,387	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102½—104½	100 —102 xd	102	..	..	4 18 0
80,000	Babcock & Wilcox, 1 to 580,000	1	20 %	20 %	20 %	20 %	4⅜— 4⅞	4⅜— 4⅞	87/6	..	— 3d	4 8 11
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1⅜— 1½	1⅜— 1½	..	..	..	4 0 0
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	1— 1⅛	1 — 1⅛	25/-	22/6	— ½	28 5 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	2⅜— 2⅝	2⅛— 2⅜	55/-	50/-	— ½	15 2 1
40,100	Do. do. "A" 6 % Cum. Pref. ..	5	6 %	6 %	6 %	6 %	3⅝— 4	3⅜— 3¾	61/3	51/3	— 1/6	7 14 10
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3¾— 4¼	3⅞— 4¼	75/-	68/9	..	4 8 11
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½%	5½%	5½%	95 —100	95 —100	..	..	..	5 10 0
500,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	8 %	8 %	143 —147	145½	144½	..	..	5 8 10
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	5 %	6 %	122 —125	121 —124	123	122	—1	4 16 9
400,000	Do. 5 % Cum. Perp. Pref. Stock ..	100	5 %	5 %	5 %	5 %	109 —112	110 —113	110½	..	+1	4 8 6
238,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 —104	102 —104	..	..	..	4 6 7
212,600	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
188,301	British Electric Traction	10	3 %	Nil	Nil	..	⅞— 1⅛	⅞— 1	18/9	16/3	— ⅛	Nil
161,437	Do. do. 6 % Cum. Pref.	10	6 %	6 %	8 %	..	2¾— 3⅛	2½— 3	57/6	53/9	— ⅜	10 0 0
1,473,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	92 — 95	92 — 95	92½	..	..	5 5 3
593,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	68 — 72	68 — 72	..	..	..	6 5 0
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	10 %	7⅜— 7⅝	7⅜— 7⅝	7⅜	..	..	6 9 0
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6⅜— 6⅝	6⅜— 6⅝	..	..	..	4 7 3
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	105 —108	103 —106 xd	..	..	..	4 4 11
904,940‡	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	91 — 96	91 — 96	..	..	..	4 18 11
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	Nil	3/16— 7/16	3/16— 7/16	6/-	..	..	Nil
1,018,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	40 — 44	38 — 42 xd	..	..	..	9 10 6
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	5/16— 7/16	7/16— 1/2	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 106,731 ..	2	2½%	Nil	Nil	Nil	0 — 1/8	0 — 1/8	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	Nil	0 — 1/4	0 — 1/8	..	..	..	Nil
195,000‡	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	48 — 48	43 — 48	..	..	..	9 8 6
195,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	29 — 33	27 — 31 xd	..	..	..	14 10 2
197,510	Calcutta Trams, 1 to 197,510	5	8 %	8 %	6 %	..	4⅜— 4⅝	4⅜— 4⅝	..	..	..	6 6 4
45,804	Do. 5 % Cum. Pref., Nos. 1 to 39,880..	5	5 %	5 %	5 %	5 %	4⅛— 5⅛	4⅜— 5 xd	..	..	..	5 0 0
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	100—103	97½—100½ xd	..	..	..	4 9 7
35,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9⅜— 10⅜	9⅜— 10⅜	10⅛	..	..	7 4 7
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅛— 5⅜	5⅛— 5½ xd	..	..	..	4 15 3
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 —107	103 —105 xd	106½	..	..	4 5 9
491,223	Cape E. Trams., 1 to 491,223	1	Nil	Nil	Nil	..	⅜— ⅝	⅜— ⅝	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	6 %	8 %	12 %	..	1⅝— 2	1⅝— 2	40/-	38/9	..	6 0 0
310,158	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	102 —106	102 —106	..	..	..	4 4 11
1,890,690	Central London Railway, Ord. Stock	Stock	4 %	4 %	3 %	3½%	64 — 66	63 — 65	64	63	—1	5 0 0
554,655	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	85 — 87	84 — 86	..	..	—1	4 13 0
554,655	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	49 — 51	47 — 49	..	..	—2	5 2 0
1,500,000	City and South London Railway	Stock	4½%	5½%	2½%	4½%	31½— 33½	31 — 32	31½	31	— ½	4 13 9
85,000	Crompton & Co., Nos. 1 to 85,000	5	3½%	5 %	5 %	5 %	1 — 1½	1 — 1½	..	..	..	9 7 6
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,800 of £50 Red.	..	5 %	5 %	5 %	5 %	94 — 97	94 — 97	..	..	..	£ s. d. 5 3

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(Continued.)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(Continued)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1905.	1906.	1907.	1908	Closing Quotations June 22nd.	Closing Quotations June 29th.	Business done week ended June 29th, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1½ — 1⅝	1½ — 1⅝	..	..	..	8 0 0
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1²⁹⁄₃₂ — 1³⁄₃₂	1²⁹⁄₃₂ — 1³⁄₃₂	..	..	..	4 16 0
271,080	Do. do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	101 —104	99 —102 xd	..	..	..	4 8 3
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	6 %	13 — 14	13— 14	..	..	..	4 5 9
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	4½ %	4½ %	2½ %	..	⅜ — ½	⅜ — ½	..	..	..	15 0 0
17,188	Do. "A" shares, 01—017,189	5	4½ %	4½ %	2½ %	..	1⅝ — 2⅛	1⅝ — 2⅛	..	..	..	5 0 0
307,895	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	70 — 75	68 — 73 xd	..	..	..	6 9 7
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	84 — 87	84 — 87	..	..	..	5 12 4
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	⅞ — 1	1 — 1⅛	10/-	..	..	Nil
31,290	Do. do. 7 % Cum. Pref., 1 to 31,290	2	7 %	7 %	7 %	7 %	1⅛ — 1⅛	1⅛ — 1⅛	..	..	+ ⅛	8 7 2
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7⅜ — 7½	7⅜ — 7½xd	..	..	..	6 13 4
800,000	Do. do. 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	85 — 88	85 — 88	..	..	..	4 10 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	¾ %	Nil	¾ — 1	¾ — 1	18/9	..	..	6 13 4
95,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10½ — 10⅝	10½ — 10⅝	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103	102 —103½	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15 %	15%	15 %	11⅜ — 12⅜	11⅜ — 12⅜	12½	11⅞	..	6 1 2
40,000	Do. do. 4½ % Pref.	5	4½ %	4½ %	4½ %	4½ %	5 — 5⅜	5 — 5⅜	5⅜	5	..	4 3 9
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½ %	4½ %	4½ %	4½ %	104 —106	104½ —106½	106	105½	+ ½	4 4 6
50,000	India-Rubber, Gutta-percha & Telegraph Works.	10	10%	10 %	10 %	..	14½ — 15½	14⅝ — 15½	14⅞	..	..	6 11 2
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	½%	Nil	⅛ — ⅜	⅛ — 1	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5 — 6	5 — 6	..	..	..	8 6 8
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	3 %	Nil	1½ — 2½	2 — 3	..	..	..	4 8 11
399,980	Do. do. 50,008 to 100,000	10	3 %	3 %	3 %	Nil	3 — 4	3½ — 4	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	83⅓ %	1⅞ — 2½	1⅞ — 2½	..	..	..	15 0 0
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	%	4 %	69 — 73	64 — 78 xd	..	..	..	5 17 8
5,782,062	Metropolitan Consolidated	100	2⅜%	1 ⅜%	⅜%	⅜%	38½ — 39	38⅜ — 39	39⅛	38⅜	..	1 5 9
2,640,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	69 — 71	68 — 70	69½	69½	—1	3 18 7
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	17⅛ — 17⅜	17⅛ — 17⅜	17⅛	17⅛	..	Nil
891,337	Metropolitan Electric Trams., Ord.	1	..	..	..	44%	⅜ — ½	⅜ — ½	..	..	..	..
314,016	Do. do. Defd.	1	Nil	Nil	Nil	Nil	⅛ — ⅜	⅛ — ⅜	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	⅞ — 1	⅞ — 1	..	..	..	5 19 5
595,500	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	99 —101	96½ — 98½xd	98⅜	..	..	4 11 5
$10,828,200	Mexico Trams Co., Common Stock	..	..	..	..	..	146 —148	121 —124	134½	122	—24½	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	5 %	93 — 95	92 — 94	92¾	91½	—1	5 6 5
245,500	Potteries Electric Traction	1	4 %	4 %	4 %	Nil	⅞ — 1	⅞ — 1	..	..	..	8 13 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1 — 1⅛	1 — 1⅛	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	86 — 89	86 — 89	..	..	..	5 1 2
87,350	Telegraph Construction and Maintenance	12	15 %	15 %	17½%	15 %	33 — 34½	33 — 34½	34	..	..	5 19 0
140,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17 8
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	101 —102	101½ —102½	102½	102	..	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½%	89 — 91	89 — 91	..	..	..	4 18 11
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	38 — 40	37 — 39	..	..	—1	..
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	5	Nil	Nil	10 %	Nil	⅝ — ¾	⅝ — ¾	..	..	..	..
66,666	Do. 6 % C.P., 80,001 to 80,000 & 126,001 to 141,666	1	Nil	..	6 %	6 %	2⅛ — 3 1/16	2⅛ — 3⅛	..	..	—⅛	7 7 4
245,495	Do. % 1st Mort. Deb. Stock	..	4 %	4 %	4 %	4 %	76 — 78	76 — 80	..	..	..	5 0 0

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	..	5½%	5½%	5½%	5½%	4½ — 4⅝	4½ — 4⅝	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 13 9
80,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	10 %	8½ — 9	8½ — 8⅝	8⅝	8⅜	— ⅛	5 14 3
9,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	8 — 8½	8 — 8½	..	..	..	4 2 4
886,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	97 —100	97 —100	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	3⅞ — 4⅛	3⅞ — 4⅛	83/9	80/-	..	5 14 3
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	4 12 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅞ — 4⅛	3⅞ — 4⅛xd	..	..	..	5 9 1
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 99 xd	96 — 99	..	..	..	3 19 3
49,486	Chelsea Electricity Supply, Ord.	5	5 %	4½%	4½%	4½%	3⅞ — 4⅛	3⅞ — 4⅛	..	..	..	5 9 1
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102 —105	100 —103 xd	102½	..	..	4 7 5
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	10½ — 11	10⅜ — 11	..	..	..	5 9 1
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11⅜ — 12½	11⅛ — 12⅜	12 1/16	..	+ ⅛	4 14 1
400,000	Do. 5% Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	121 —124	119 —123 xd	..	..	..	4 2 0
300,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	101 —104	99 —102 xd	101	..	..	4 8 3
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2⅜ — 3⅛	2⅜ — 3⅛	..	..	..	3 6 8
50,000	Do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3¼ — 3⅜	3⅛ — 3⅜	..	..	..	6 13 4
250,000	Do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	96 — 98	93⅜ — 95½xd	..	..	..	5 4 9
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	8⅛ — 8⅝	8⅛ — 8⅝	..	..	..	5 14 3
55,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅝ — 11⅛	10⅝ — 11⅛	11	10⅞	..	5 8 8
400,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	106 —109	104 —107 xd	105½	..	..	4 4 1
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	101½	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	4 %	Nil	Nil	Nil	⅛ — ⅜	⅛ — ⅜	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	3 %	Nil	Nil	⅜ — ½	⅜ — ½	13/9	..	..	Nil
480,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	60 — 63	60 — 63	..	..	..	7 2 10
$3,150,000	Electrical Dev.Co.of Ontario, 6% 1stMtg.Gold Bnds.	$500	..	..	..	5 %	87 — 89	85½ — 88½xd	88½	88	..	5 13 0
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4½ — 5	4½ — 5	..	..	..	5 10 0
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	5 %	5 — 5½	5 — 5½	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½%	8½%	7⅞ — 7⅞	7⅞ — 7⅞	..	..	..	5 11 6
$1,576,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	100 —101	100 —101	100⅜	100⅜	..	4 19 0
31,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	10 %	8 %	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	5 8 6
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	97 —100	97 —100	..	..	..	3 19 3
111,000	London Electric Supply Corporation, Limited, Ord.	8	4 %	4 %	2½%	3 %	1⅛ — 2⅛	1⅛ — 2⅛	..	..	..	4 16 0
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	5 11 8
885,855	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½%	4½%	4 %	90 — 94 xd	90 — 94	..	..	..	4 8 4
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6½%	5 %	4⅜ — 4⅝	4⅜ — 4⅝	91/3	89/4½	..	5 5 3
75,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅜ — 5⅛	4⅜ — 5 xd	96/3	..	..	4 10 0
285,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	107 —110	105 —108 xd	..	..	..	4 3 4
248,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	85 — 88	83½ — 86½xd	..	..	..	4 . 11
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	82½ — 84½	83 — 85	84½	83⅜	..	5 18 4
18,585,000	Do. Light and Power Co., Ltd., Common	$100	..	..	..	3½%	68 — 71	67 — 70	69	67	—1	5 0 0
$2,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	104 —107	100 —104	106	103½	—3½	6 14 7
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	85½ — 87½	85½ — 87½	86⅜	85	..	5 14 3
480,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
130,491	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	2½%	4⅜ — 5⅛	4⅜ — 5⅛	..	..	..	2 7 8
137,000	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	4⅜ — 5⅛	4⅜ — 5⅛	..	..	..	4 15 8
126,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	99 —101	99 — 101	..	..	..	..
10,859	Notting Hill Electric Lighting	10	7½%	7½%	7½%	7 %	11½ — 12½	11½ — 12½	..	..	..	5 12 0
20,000	Oxford, 1 to 96 and 407 to 20,810	5	7 %	7 %	7 %	..	6 — 6½	6 — 6½	..	..	..	5 7 8
60,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 1 8
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	..	2½%	5 %	8 %	1⅜ — 1½	1⅜ — 1½	..	..	..	5 6 8
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6 %	6 %	6 %	6 %	1⅜ — 1⅝	1⅜ — 1⅝	20/6	..	..	5 15 3
200,000	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	103 —107	102 —106 xd	104½	..	..	5 8 1
40,000	St. James' and Pall Mall Electric Light, Ord.	5	12½%	10 %	10 %	10 %	8⅞ — 9⅛	8⅞ — 9⅛	..	..	..	6 13 4
70,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	7 %	7 — 7⅛	7 — 7⅛	..	..	..	4 13 4
459,000	Do. do. 3½ % Deb. Stock Red.	100	3 %	3½%	3½%	3½%	86 — 90	84 — 88 xd	..	..	..	3 19 7
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	Nil	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
65,000	South London Electric Supply, Ord.	4	4 %	3 %	4 %	5 %	2⅜ — 3⅛	2⅜ — 3⅛	..	..	..	6 9 0
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	2½%	⅝ — ¾	⅝ — ¾	..	..	..	4 8 11
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅞ — 1 15/16	1⅞ — 1 15/16	..	..	..	5 6 8
224,520	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100—103	100 —103	101½	..	..	4 0 0
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	⅞ — 1	⅞ — 1	..	..	..	25 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1½ — 2⅜	1¼ — 2⅜	..	..	..	10 10 6
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	80 — 84	80 — 84	..	..	..	5 7 2
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	5 %	2⅝ — 2⅞	2⅝ — 2⅞	16/10½	..	..	5 19 5
110,000	Westminster Electric Supply, Ord.	5	12 %	12 %	10 %	10 %	8¾ — 9⅛	8¾ — 9⅛	..	..	..	5 6 8
81,279	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5⅛ — 5⅜	5⅛ — 5⅜	5 1/16	5⅛	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

Bank rate of Discount 2½ per cent., April 1st, 1909.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING MAY, 1909.

While this month's export returns do not come up to the high level of the April figures, they still attain very satisfactory proportions. Thus, during the month of May the exports amounted in value to £269,341, which compares with £297,690 in the preceding month. Included in the former amount is £49,192 worth of telegraphic exports, leaving £220,149 as the value of general business, which is comparable with previous years' returns, when the telegraphic section was not included. The imports also dropped off considerably, the total amounting to £122,736, as compared with £138,762 in the previous month; and the re-exports declined by £3,000 to £10,023.

On the whole, the first five months' export business has been quite as good as in the closing months of 1908, the position is, however, quite otherwise as regards the imports.

During the month some £93,000 worth of electrical machinery was exported, the telegraphic and cable items were also well represented; the import section shows an improvement in the machinery total, and a large decrease in value of lamps imported. The more prominent purchasers were Japan, India, Brazil, and the Argentine in the order named.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Country receiving exports and importing.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric lamps and parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	151	230	49	42	216	3,593	98	...	25	1,030	3,462	8,896
Germany	367	1,671	...	86	94	846	76	26	57	84	626	3,933
Netherlands	441	1,682	30	10	10	212	...	17	6	199	101	2,698
Belgium	272	148	36	38	241	1,183	70	165	...	915	236	3,304
France	12	...	212	580	...	3,572	125	...	...	...	31	4,832
Switzerland	3	...	...	...	13	...	...	...	...	...	...	16
Portugal, Madeira, Portuguese Africa & India	190	371	142	65	...	455	20	39	...	25	12,412	13,719
Spain, Canary Isles and Spanish Africa ...	40	...	75	227	...	2,020	...	8	11	27	42	2,450
Italy and Austria-Hungary	296	...	93	60	291	4,950	...	...	...	21	1,535	7,246
Greece and Turkey	72	...	...	40	...	746	...	160	...	4	384	1,406
Channel Isles, Gibraltar, Malta and Cyprus ...	156	374	40	...	317	1,248	354	2	...	17	337	2,845
U.S.A., Cuba and Philippines	8	...	500	38	95	377	...	4	93	...	368	1,483
Canada and Newfoundland	7	5,220	327	198	563	785	277	304	..	584	643	9,108
British West Indies and British Guiana ...	...	15	...	38	...	68	..	73	18	19	...	231
Mexico, San Salvador and Colombia	17	195	9	...	...	220	...	...	...	1,753	...	2,194
Peru and Uruguay	54	14	260	47	...	...	...	51	11	..	...	437
Chile	198	175	66	576	...	613	3,804	21	104	94	350	6,001
Brazil	298	841	550	230	352	4,231	522	151	...	568	17,413	25,156
Argentine	2,593	1,882	685	674	267	5,969	145	3,749	94	1,536	1,005	18,599
Egypt	96	391	55	118	43	177	...	53	...	873	134	1,940
British West Africa and St. Helena	8	60	73	130	107	235	...	34	...	239	321	1,207
Cape of Good Hope	230	539	318	66	85	4,995	103	1,088	...	61	51	7,536
Natal	635	3,864	45	256	5	1,418	...	23	...	43	57	6,346
Rhodesia, Orange River Colony and Transvaal	795	3,444	240	852	...	1,163	...	...	25	267	530	7,316
Zanzibar, Brit. East Africa, Mauritius and Aden	77	144	51	90	6	231	7	55	...	35	25	721
China and Siam	695	4,174	756	925	17	792	1,331	130	197	...	240	9,257
Japan	44	6,170	2,404	53	335	22,154	1,880	...	...	508	3,148	36,196
India	1,278	8,419	1,660	1,329	368	8,496	1,867	1,288	182	1,353	355	26,595
Ceylon	33	15	7	166	...	1,167	80	...	...	32	...	1,500
Straits Settlements and Fed. Malay States	38	910	154	...	138	1,785	...	25	40	57	58	3,205
Hong Kong	246	224	2,896	125	...	1,051	...	16	15	4	...	4,579
West Australia	230	363	...	59	...	561	...	5	12	...	2,000	3,230
South Australia	134	535	24	132	...	626	...	29	...	713	...	2,193
Victoria	1,061	674	25	695	82	859	...	59	...	10,761	144	14,360
New South Wales	783	1,087	323	1,153	723	3,696	335	295	...	40	2,612	11,047
Queensland	75	201	59	...	8	2,668	...	...	...	31	45	2,987
Tasmania	160	...	35	...	...	...	...	...	...	...	49	244
New Zealand and Fiji Islands...	296	2,196	266	501	372	9 098	140	49	...	34	278	13,330
Total, £	12,089	46,228	12,465	9,599	4,748	93,450	10,534	7,919	890	21,927	49,192	269,341

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

	£	£	£	£	£	£	£	£	£	£	£
Norway, Sweden and Denmark	11	...	...	39	...	605	...	317	...	4,098	5,070
Germany	908	7,609	1,191	24,884	1,644	22,948	...	537	4,139	8,983	72,843
Holland	120	189	...	2,014	20	19	...	...	141	...	2,503
Belgium	550	2,018	352	173	132	1,618	58	66	275	7,402	12,644
France	8	152	1,648	1,665	739	215	...	1,627	2,316	851	9,421
Switzerland	41	219	...	4	225	359	...	...	212	4	1,064
Italy	160	694	35	...	...	140	...	...	...	...	1,029
Austria-Hungary...	3	364	...	785	8	36	...	...	1,591	533	3,310
United States	2,283	75	688	838	292	7,209	1,391	285	41	1,740	14,842
Total, £	4,084	11,320	3,914	30,602	3,060	33,149	1,449	2,832	8,715	23,611	122,736

Additional imports: Spain, carbons, £26.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

	£	£	£	£	£	£	£	£	£	£	...
Various countries, mainly as above	1,885	138	...	1,765	...	3,338	...	527	528	1,842	...

Total Exports: £269,341. Total Re-Exports: £10,023. Total Imports: £122,762.

Note.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

REVIEWS.

The Life-Story of Sir Charles Tilston Bright, Civil Engineer. Revised and Abridged Edition. By CHARLES BRIGHT, F.R.S.E. London: Archibald Constable & Co., Ltd. 1908.

The author in his Preface describes this work as an abridgment of the original biography under the same title by the joint authors, Edward Brailsford Bright and Charles Bright, having been specially prepared in view of the fiftieth anniversary of the Atlantic Cable celebrated last year.

After some details of genealogy and boyhood in the first two chapters, we are given in the third an interesting account of Bright's start in life as a telegraph clerk at the Harrow Station of the L. & N.W. Railway, and his early work laying andlines in the service of the old Electric, the British and the Magnetic Companies from 1847 to 1860. His career so far marked unmistakably the man of action and resource, and after laying a network of landlines over the kingdom and devising instruments and improvements in apparatus for working them, it is not surprising to find that he took up the construction and laying of submarine lines, at that time just demonstrated practicable. He saw the Atlantic from afar, and prepared himself for it by experiments in signalling over long lengths of underground landlines and by laying the first cable to Ireland.

In Chapter V the story of his crowning achievement—the Atlantic Cable—is related in 15 sections, covering the period from the first attempt in 1857 and the successful but short-lived cable of 1858, to the 1865 and 1866 successes.

One of the most remarkable events in the 1858 Expedition related in this work was in connection with the arrangement that the two vessels, after splicing in mid-ocean and paying-out, were to return to the rendezvous and start again in the event of the cable parting. After three attempts the fourth start was made on the agreement that if the cable parted before the ships had gone 100 miles they were to return and start again, but if the 100 miles were exceeded the ships were to proceed homewards. The cable actually parted after the *Agamemnon* had gone 114 miles, and the excess over 100 being so little she elected to put back, assuming that the *Niagara* would do the same, but after beating up to the rendezvous against a heavy gale and cruising around in a fog she was obliged to turn homewards, the *Niagara* having acted strictly on the agreed distance and gone home.

Other points standing out in historical interest are related. For instance, the failure to use Lord Kelvin's (then Prof. Thomson's) reflecting mirror on the completed 1858 cable, and the fatal mistake made of using high-tension induction apparatus for signalling, gradually killing the cable thereby. Also the fact that the smallness of the core of the first Atlantic was approved on scientific grounds by such great names as Faraday and Morse, while Bright had correctly counselled a heavier core. It is, indeed, striking reading from the point of view of scientific expert opinion as advanced from time to time; some right, others hopelessly wrong. Many such proved to their own satisfaction the impracticability of laying an Atlantic cable. Others, among whom Lord Kelvin was greatest, showed that the scheme was practicable. Of the many interesting features of this part of the work the side lights thrown from time to time upon the early life and sayings of this most distinguished and beloved scientist are of especial interest.

There is very little of Sir Charles's own writings given us in connection with the Irish and Atlantic Cables, and it is somewhat surprising that no references by Atlantic shipmates appear except the short and graceful notes by Lord Kelvin, who, though himself never self-assertive, was ever ready to encourage and notice the best points in others.

Chapter VI contains the story of the first Mediterranean Cables laid in three sections from Malta to Alexandria, and the Spanish Cables in 1860.

In Chapter VII Sir Charles Bright's improvements in cable making appear, particularly his patent for the outer serving, and the process of application of preservative compound which rendered so lucrative a return to himself and his partner, Mr. Latimer Clark.

Chapter VIII, under the title of the "Telegraph to India," contains the account of the Persian Gulf Cable Expedition. In describing the segmental conductor then tried, it is of interest to note that copper for cables was of 76 per cent. purity, and that in cables previous to this, the conductivity was as low as 30 and 40.

Chapter IX treats of Sir Charles's election as Member of Parliament for Greenwich, and some interesting glimpses of his Parliamentary experiences.

In Chapter X we have notice of the introduction in 1859 of Mr. William Hooper's vulcanising process for india-rubber, as used for submarine cables of that time, and so much in vogue to-day for electric light cables.

The active part taken by Sir Charles in the cables to India, China and Australia is related fully in this chapter. Most people when going through the biography of a great man, are chiefly attracted by those portions revealing the secrets of his start in life, and those of his own writings, throwing light on the more human side of his career. The great achievements of such men are known to all the world; the fame of them has been sounded far and near, and for years the works connected principally with their name have been known, talked of, read of, and in some cases impregnated within us almost to the verge of super-saturation. While it is true that excellent and refined music can be drawn from the trumpet, such as will command the highest appreciation from those who hear it, there is, nevertheless, the possibility that the appreciation may not continue at so high a pitch if the same tune is played over and over again on the same instrument for an indefinite period of time. The biography must of necessity contain these great events, but what we look for, more than anything else, is the pourtrayal of the man himself. We want to know him as he lived, his aims, his attitude in difficulties and triumphs, his strong points, his weaknesses, his pleasures and his struggles. It is always of interest to learn of the early days and start in life of such a man, and how he rose to success.

Of official reports, speeches and newspaper accounts of expeditions in which Sir Charles took part, the author provides enough to satisfy the most rapacious instincts, the story of the first Atlantic expeditions being almost entirely compiled from the *Times* correspondent's articles. These articles, let us say in passing, are exceptionally good, and show evidence of considerable study of the nautical and technical matters handled. Moreover, in reading them one is not bored by any hard labouring to say smart things, so frequently the cause of an otherwise fair effort being rendered commonplace.

In default of so little written by Sir Charles himself, we should have expected to see more accounts by those who worked in co-operation with him, such, for instance, as the very entertaining reminiscences on page 262 by Mr. F. C. Webb, his chief engineering assistant. Such details could not, of course, be supplied from the author's own experience, as his birth (chronicled on page 240) occurred only seven years before Sir Charles entirely discontinued taking an active part in the laying of cables.

As to Sir Charles's rise to the position of influence and success which he very justly won, it may be said that a successful career is always a useful one, and is founded upon, first, attaining the necessary qualifications to be of use to the community in one particular line; and, secondly, the occurrence of opportunities at the right time when those qualifications are most needed by the community. To some the opportunities come too late or too early. To others they simply follow each other in succession exactly at the right moments of time. Some seize them, while others fail to do so.

In the biography of Sir Charles Bright before us, we cannot fail to perceive that those qualifications which he earned for himself were just those for which opportunities occurred at the right time for their fullest exercise. His landline experience fitted him to embark on cable laying just when cable laying was commencing to be in demand. His experience on the Irish cables fitted him for the Atlantic expeditions just when these enterprises were taken in hand. His Atlantic experience fitted him for the services he rendered to Parliament and the Government, and for the laying of the Persian Gulf and other cables. This must not

be misunderstood in any way to suggest detraction from his abilities and perseverance, but rather to enhance these qualities as their development was stimulated.

The author has evidently deemed it unnecessary to trouble much about his descriptions of early cable-laying machines; otherwise the illustrations and explanations, with a little care expended upon them, might have been made intelligible and interesting. In the first Atlantic paying-out gear, for instance, on page 79, the rods connecting the brakes with the self-releasing levers in the elevation might have been shown in the plan, or the fact pointed out that each brake wheel had a separate attachment. The illustration on page 76, although entitled "the self-releasing brake," does not show the self-releasing action, and that on page 77, although entitled "the principle of the brake," shows no connection between the weights and brake band, the latter being shown as continuous instead of in two parts, with the proper articulated motion for applying and releasing. It would be more to the point if the titles of these two illustrations were interchanged, or the illustrations themselves modified so as to make their purpose clear.

There appears to be a slip in the foot-note on page 78, where it is stated that the drum is carried round by the weight of the axle as the ship moves onwards. This ought to read, "by the weight of the cable."

Chapter XI, on Sir Charles Bright's cable-laying expeditions in the West Indies, is full of human interest, great difficulties having been met with and surmounted. The climate during those five years worked death amongst his most experienced foremen and jointers, and he himself was down often enough. Shore-ends had to be negotiated by wading through pestiferous mud; yellow fever, cholera and small-pox were raging in the towns. Nevertheless, there were bright times, and the diary here given shows that there was no lack of fêtes, banquets, picnics and general exchange of courtesies between enthusiastic colonists and the cable staff as the various islands became linked up.

After this we have, in Chapter XIV, an interesting sidelight upon a part of Sir Charles's life, in which he and his brother occupied themselves in mining. The work concludes with a digest of Sir Charles Bright's 130 inventions, comprised in 20 patents, several of which related to electrical generators and lighting.

Altogether, the work is a well-written record of a distinguished life, and in a style which can be appreciated by the non-technical as well as the technical reader.

THE PREVENTION OF SMOKE.

By WILFRED YORKE, A.M.I.E.E.

In the technical Press recently the case of an electric lighting company being fined for the production of smoke was cited, the defence being that the emission of smoke at times was unavoidable, although the company had spent upwards of £2,000 in their efforts to mitigate the offence.

In the face of up-to-date practice, which has proved that such a nuisance can be absolutely avoided, such pleading is rather remarkable, and seems to show that the results of the empirical methods of burning coal in a boiler furnace that became standard (?) practice in the early days of steam engineering, and which, together with the poor condition steam plant deteriorated to generally, induced Fairbairn to found the Manchester Steam Users' Association, still have a faint echo in many parts of the country, with the accompanying plea that the production of smoke cannot be avoided at times.

The writer, therefore, hopes that the following remarks embodying the essentials of modern practice, together with particulars of the success attending the serious application of these methods, will prove interesting to the readers of this journal.

Most electric lighting and power undertakings in this country favour the use of bituminous coal, since it is much cheaper than smokeless coal (anthracite or semi-anthracite), and when handled scientifically is quite as efficient and as smokeless.

It is particularly interesting to note at this point that James Watt's ideas for burning bituminous coal are in the main quite as efficient and sound as any of the present-day methods. Watt enunciated the principle that bituminous coal should be burnt on the coking system, the green fuel being placed in front of the fire on the dead-plate to allow the hydrocarbon gases to be volatilised and burnt; the partly coked coal was then pushed back on to the grate, and its place filled with a further charge of fuel. He also realised the importance of supplying air *above* the fire to burn these volatile gases efficiently. The latter point will be referred to in detail later.

The writer is convinced that the coking system, as outlined above, is the correct method of burning bituminous coal, the advantages gained more than outweighing the drawbacks when compared with the sprinkling system, and he therefore proposes to deal more particularly with the coking method, though the general principles expounded are, of course, applicable to both systems. Further, since mechanical stoking is now practically universal in all generating stations that have any pretensions to size, this article will deal with chain-grate stokers, this being the type of coking stoker most commonly met with, especially when installed under a water-tube boiler.

Now, the coal classed as bituminous is that which contains up to about 35 per cent. of volatile matter, above which percentage the fuel ranks as "cannel," and is used chiefly for gas-making purposes. The combustion of a substance containing such a relatively high proportion of volatile matter becomes a very complex problem, since it may be considered to involve two totally different processes, namely, burning (*a*) the gaseous constituents, and (*b*) the solid or carbon portion.

The gases will burn in a very much shorter time than the carbon, and require to be intimately mixed with air to ensure complete combustion whilst passing under the fire arch and over the incandescent bed of fuel, and the emission of smoke will be solely due to the ineffectual combustion of the hydrocarbon gases evolved.

The two main essentials for achieving this combustion perfectly are temperature and air supply, and if either is deficient the production of smoke will ensue.

In the chain-grate stoker the hot zone is provided by the fire arch, which is often far too small to fulfil successfully its purpose, and might be lengthened considerably, the additional area being installed at the front of the arch and the stoker brought away from the boiler to suit. The combustion chamber would be thereby increased, and this would nullify the possibility of the gases striking the water tubes and being cooled below the point of ignition before complete combustion is effected. Such premature cooling will cause the hydrocarbons to be condensed, resulting in the liberation of carbon in a finely divided state, and smoke will be inevitable.

The air supply for the gases should be admitted at the front of the boiler in such a manner as to be drawn over the fire and intermixed with the volatile gases at the moment of their liberation. The mixture will then pass through the hot zone, and should be perfectly consumed, producing an intense heat-giving flame, carbon dioxide and steam being formed. Whereas with a deficient air supply above the fire, smoke will be formed, even though the requisite temperature is attained, due to the dissociation of the gases by the high temperature into carbon and hydrogen, which pass to the flue unburnt.

The chain-grate stoker, however, is sadly deficient as regards this supplementary supply of air, though in the usual designs of such stokers in use, it is presumed that the requisite air for the gases finds its way through the thinner portions of the fire at the back of the grate, and also as leakage between the stoker front and the side jambs. But the admission of air at the bridge of the ordinary chain grate must be regarded as a very crude method, as it not only deprives the air of the heating effect of the arch and fire, but also of the better mixing effect to be derived from admission at the front. The volume of air that finds its way through the various small openings at the front of the stoker (such as ill-fitting fire doors, joints in the stoker casing, &c.) will rarely exceed a fraction of 1 per cent. of

the total volume necessary, and must, therefore, be regarded as negligible.

Hence it becomes necessary from a theoretical point of view to make some proper provision in the front of the stoker for the admission of air over the fire for the purpose of consuming the volatile constituents of the coal, and until such an allowance is made the writer feels convinced that the present designs of chain grates will continue to be offenders by producing smoke. It is obvious that such an opening should be controlled by a damper or register to regulate the volume of air admitted in proportion to the hydrocarbons in the various classes of coal; and in cases where the draught at the boiler damper is less than ½ in. of water, it will be necessary to use a small high-pressure steam jet in the air opening to ensure the satisfactory admission above the fire.

It might be mentioned here that poor draught, due usually to an overloaded chimney, is in many cases the fundamental cause of smoke, since to ensure proper combustion the pull at the boiler damper should be at least ¾ in. of water.

The table given was deduced from some six experiments carried out on a water-tube boiler fitted with the usual type of chain-grate stoker, and these fully prove the soundness of the assertions made.

In the first test the stoker was left in its usual position, and all openings in front were plugged with lagging composition. The latter was afterwards removed for the second test, the opening round the front of the stoker being equivalent to ¼ in., or an area of ⅓ sq. ft. This opening was then increased for each successive test by drawing the stoker away from the boiler bodily until, on the final test, it was 2 in. distant from the boiler front, leaving an opening equal to 2⅓ sq. ft. This latter figure agrees closely with Rankine, who gives a consumption of 24-27 lb. of coal per sq. ft. of grate surface per hour with natural draught, and *air holes in the fire doors equal to ⅛ of the grate surface.*

Test No.	Conditions.	Area of opening at stoker front.	% of opening to grate surface.	CO_2	Velocity of air. Under grate. Ft. per min.	Velocity of air. Over doors. Ft. per min.	Cubic feet of air per hour over fires.	Per cent. to that necessary for combustion.*	Smoke.
1	Stoker in usual position, all openings stopped.	—	—	12·6	230	—	—	—	dark brown
2	Cement removed, leaving an opening of ¼ in.	·307 sq. ft.	·35	12·0	230	82	1,510	0·25	brown
3	Stoker drawn ½ in. away from boiler.	·62 „	·7	11·55	223	160	5,940	0·98	light brown
4	Stoker drawn 1 in. away from boiler.	1·24 „	1·4	11·0	225	305	22,600	3·74	very light brown
5	Stoker drawn 1½ in. away from boiler.	1·86 „	2·1	10·5	220	464	54,430	8·5	very slight haze
6	Stoker drawn 2 in. away from boiler.	2·37 „	2·7	10·0	220	614	87,100	14·4	none

Draught—at boiler damper ¾-in. water. Draught—over fire damper ·35-in. water.

* Air necessary for combustion assumed to be 22 lb. per lb. of coal with a consumption of 25½ lb. of coal per sq. ft. of grate surface per hour.

The thickness of the fire was regulated so as to keep the bars covered right to the back, and the speed of the drive was adjusted to suit.

The density of the smoke was accurately ganged by inserting an ordinary electric glow lamp in the boiler setting at the rear on the far side. An aperture was then made on the near side in such a position that the products of combustion crossed the line of sight, the presence of smoke therein causing a dimming effect on the light.

Needless to add, all leakages, not only in the boiler brickwork, but also in the economiser settings and main flue, were eliminated as far as possible.

That the emission of smoke can be absolutely prevented by the exercise of scientific control is therefore patent, and as two of the largest generating stations in London are using the principles outlined above on their mechanical stokers with complete success, the writer hopes that the information given will prove useful in a small degree to those engineers suffering from the too earnest attentions of the local smoke inspector.

A GERMAN ELECTRICALLY-OPERATED WAGON-TILTING PLANT.

[BY OUR BERLIN CORRESPONDENT.]

A marked tendency can be noted towards reducing as far as possible hand labour, and using machinery in connection with the transfer of large amounts of staple matters—such as ore and coal. The plant described in the following has been recently constructed by the Benrather Machinenfabrik for a German mine, and can be considered as typical of the best Continental practice in this connection. In fact, it is the first German plant in which a single platform is used both for lifting and tilting.

The plant in question is designed to transfer ore and blast-furnace materials on their arrival in ordinary open goods wagons into self-tilting Talbot cars, and mainly consists of two parts—viz., devices for raising the full car and tilting it on to the hopper of 120 tons capacity placed beside the latter, into which the cars are unloaded. The materials are thence discharged through a movable chute into the self-tilting cars. The chute and locking valve are operated by a common electric winch. Four wire ropes supporting the platform, 84⅔ ft. in length and 77½ ft. in width, and leading over guiding rollers towards the four drums on which they are wound up, are used as lifting gear for the wagons to be unloaded. The drums are operated in pairs by one motor each, for the fore and back ends respectively of the platform. However, the two driving gears are connected together during the lifting at a height of 36⅔ ft. by a friction clutch mounted on the continuous worm shaft. The output of each motor is 45 H.P., with a lifting speed of 5·5 metres per minute. In order to avoid any loss in time by the arranging and shifting of the cars to be discharged, the tilting device has been constructed with its longitudinal axis coincident with that of a railway track interrupted by the platform.

The loaded cars are brought to one side of the plant, and after being discharged leave it from the other side of the hopper. The discharging of a car is carried out as follows:—

The platform, in its lowest position, rests on the foundation with its sliding doors opened, being carried on felt buffers, thus turning down the track locks fitted into the feeding tracks and into the platform. The filled car is drawn on to the platform by means of capstans, its speed being reduced, whenever required, by the rail brake actuated through a spindle device on the platform, which acts on the wheel rims. On coming down, the car itself actuates two substantial clamps embracing the fore axle. The operator, who is located in a cabin above the hopper, then sets the driving gear working by means of a controller and two self-acting reversing starters. On lifting the platform a track-lock, which prevents the car from moving, is erected behind the last axle of the car, while the feeding

tracks at the same moment are locked and the pit doors closed. After a lift of 35⅝ ft., the current is cut off automatically, and by means of a pedal the operator then causes a support, consisting of two props at the back end and two bearings for the tilting pivots at the fore end of the platform, to advance, thus opening two rotary framework doors which prevent any access from the operator's cabin to the pit. The platform is then lowered on to the support and the driving gear stopped automatically, after which the operator proceeds to the cabin in order there to disengage the locking bolts of the front wall of the car. One of the motors is now thrown out of circuit and the clutch connecting the two motors disengaged; if now the reversing starters be actuated, only the motor lifting the back part of the platform will receive current, while the platform with the car turns on two circular guiding rails round the tilting pivots until it reaches an angle of 45° with the horizontal. During the tilting operation, the platform swings above the rope winches, after the safety device for preventing the ropes from gliding off the winches has been removed. The current is cut off automatically with an inclination of less than 45°.

As soon as the platform has commenced tilting, the hand lever actuating the clutch and commutator is again locked, and on the platform returning to a horizontal position, the rope guard is again turned round by the platform, and

Wagon-Tilting Plant.

current cut off automatically on its arrival in that position.

The second motor can now be brought into use and connected by the clutch with the other one.

The operator now lifts the platform up to its uppermost horizontal position, thus causing the framework doors to close, the props to be withdrawn and the actuating levers to be closed, while the current is cut off automatically at the end. The platform being now lowered, the sliding doors are opened and the controller lever moves automatically into its central position. As the platform arrives at its lowermost position, the clamps carrying the car and the three track-locks are turned down, when the car can be taken out beneath the hopper. On leaving the platform, the car also disengages the clamps so as to allow all the axles of the empty car to pass over the platform, and the first axle of the next full car is again seized by the clamps. Any possibility of accident due to carelessness of the operator is entirely excluded, the current being interrupted automatically after each motion of the platform, both in lifting,

Wagon in Position for Discharge.

tilting, and lowering, the operator being able only to start the motion corresponding to each operation by closing the circuit.

The Fixation of Nitrogen.—It was recently reported that the Baden Aniline and Soda Works, of Ludwigshaven, whose works for the winning of nitrate from the nitrogen of the atmosphere are still in course of construction in Norway, proposed to erect similar works in Italy. The report stated that the company were in negotiation with the Marquis Cornaggia, of Milan, on the subject, that preliminary studies had been in progress for some time past, that an engineer sent to Italy was satisfied with the investigation of the water power available, and that a contract would soon be signed in Milan. It was then intended to form the Societa Anonima per la Fabricazione di Nitrato, with a capital of £480,000 and the co-operation of German and Italian banks, and then proceed, in the first place, with the erection of plant of 30,000 H.P. It was added that with the participation of the Societa Generale per la Cianamide of Rome, it was intended to erect nitrate works for the utilisation of water-power in Dalmatia, the plant to be arranged according to the patents of the Ludwigshaven company. The latter, on being asked as to the accuracy of the report, states that it is correct that the company is negotiating in regard to the grant of a licence for its nitrate process to the Advocate Cornaggia, of Milan, that preliminary investigations are in hand, and that an engineer has been dispatched to examine the source of water-power concerned, but all the other statements in the report are declared to have no foundation in fact.

Company and Municipal Tramway Co-operation.—A further instance of co-operation in the industrial district of Rhenish-Westphalia is recorded by the transfer to an Essen group of the majority of the shares in the South German Railway Co., which in addition to other lines carries on the Essen tramways, of a total length of 37 miles. These other lines proceed to Horst in the north, Bredeney in the south, Gelsenkirchen in the north-east, Steele in the east, and Oberhausen in the west. These ramifications, which are to be amplified by a number of shorter lines, bring the Essen network into touch with various other tramway systems, particularly those of the Bochum-Gelsenkirchen Co., and those of Oberhausen and Mulheim on the Ruhr. The Essen group, already mentioned, consists of the town of Essen, the Essen circuit, and the Rhenish-Westphalian Electricity Works Co., which is a pit-mouth supply undertaking, and as it owns the majority of the shares in the Bochum-Gelsenkirchen tramways, it is assumed that the latter will be brought into connection with the other lines mentioned by means of junctions and through traffic. The group proposed to form a limited company with a capital of £85,000 to take over the shares, of which the town of Essen would subscribe 48 per cent., the Essen circuit 27 per cent, and the electricity company the balance of 25 per cent., whilst the company would assume a debt of £850,000, which is to be guaranteed by the town and circuit of Essen. The acquisition by the group or the company of the majority of the shares in the Southern Railway Co. will also give the former a controlling influence over, among others, the tramways of Wiesbaden and district, up to Mayence, and over the full-gauge and narrow-gauge lines in Hessen, Baden and Thuringia, and it is thought possible that the various towns concerned will also participate in the new company.

A Non-Magnetic Yacht.—A non-magnetic survey yacht, built for the Carnegie Institution, Washington, was launched at Brooklyn recently. The vessel will be used for ocean research in terrestrial magnetism, and contains no magnetic material in its structure; it is 155 ft. long with 33 ft. beam and 12 ft. draught, and has a displacement of 568 tons.—*Electrical World*, N.Y.

THE FIXATION OF ATMOSPHERIC NITROGEN BY THE BADISCHE ANILIN UND SODAFABRIK PROCESS.

A DETAILED account of this process was recently given by Dr. Schönherr in a paper read before the Elektrotechnischer Verein (*E.T.Z.*, April 22nd and 29th, 1909), from which we take the ollowing particulars:—

After a historical survey of the subject, the writer points out that the production of nitric oxide in the electric arc is a thermal effect, but that the concentration attained depends not only on the high temperature reached, but also on the rapidity with which subsequent cooling occurs, and so limits the re-combination of the products. It is chiefly because of the greater ease with which this subsequent rapid cooling can be effected that the electric arc, when suitably arranged, has proved superior to the many purely thermal processes which have been devised.

At the present time the only industrially operated processes are the Birkeland-Eyde process and the Badische Anilin und Sodafabrik process. The former, patented in 1903, makes use of the deflecting power of a magnet on the arc. The arc is fed with alternating current, whilst the magnet is a direct-current one of constant polarity, so that the arc is alternately deflected upwards and downwards in rapid succession in its narrow chamber between water-cooled copper electrodes. The arc, consequently, appears to the eye as a great disk of light. In this way without the aid of any complicated machinery large amounts of power could be brought into action, and at the present time a factory employing ,000 H.P. is operating this process at Notodden, in Norway.

The Badische A. & S. commenced experimenting at the end of the nineties at their works at Ludwigshafen a. Rh., and in 1905 the author was able to bring forward a still simpler form of apparatus than the magnetic arc arrangement. In place of the intermittent or vibrating flame which had previously been considered essential, the Badische A. & S. apparatus employs a stable, steady arc. In order to bring a large mass of air into contact with the

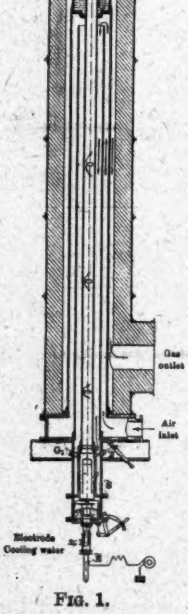

FIG. 1.

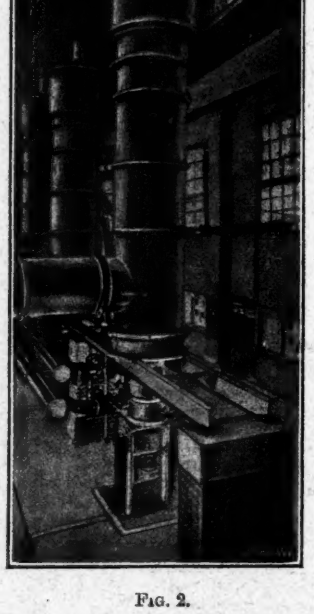

FIG. 2.

flame a long arc is employed; and, in order to avoid extinguishing or disturbing this extremely sensitive form of flexible conductor, the air is introduced with a circular motion, so that it passes over the arc with a screw-like motion. In this way the arc is kept steady in the centre of the eddying air stream, and the whole can be conveniently enclosed in a metal tube without fear of the arc jumping to the sides. In its simplest form, therefore, this apparatus consists of the metal tube and an insulated electrode at one end. The arc is started in any convenient way—for instance, by making the distance between the electrode and the tube small enough at one point to enable the H.T. supply to jump across the gap; the revolving air-blast then carries the arc before it to the end of the tube, and finally a steady arc is burning in the centre of the tube. No further arcs will occur at the gap, because an inductive resistance is always in series, and the voltage drop in this due to the current of the first arc lowers the voltage over the gap below the striking value. Should the arc be blown out from any cause, it would, however, automatically start again at the narrow gap.

The construction of the actual furnace now employed is shown in fig. 1. It consists of an insulated electrode E of iron, which becomes coated with oxide and consumes away very slowly, and is usually fed in from time to time by hand. A single electrode lasts about 2,000 hours, and the cost is only a few pence per KW.-year. The electrode is surrounded by a water-cooled copper vessel. The arc is struck between this electrode and the innermost tube (also of iron) by means of the rod z operated by hand. This rod, together with the whole of the rest of the furnace except the electrode E, is earthed, so that there is no danger to the operators. The restriking of the arc, besides, is very seldom necessary. When the arc is struck it travels, under the action of the air-blast entering tangentially by eight openings at S, up the inner tube, and comes to rest on the upper end of the tube. The correct length of arc is adjusted by means of an air controller surrounding

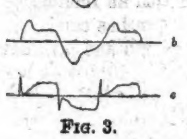

FIG. 3.

the openings at S, and the position of the top of the arc is inspected through the glasses G_2 and G_3. By looking through G_3 the arc is inspected axially, and is seen to rotate steadily and so change its position continually. The upper part of the iron tube is also water-cooled by a copper jacket, and therefore practically no wear occurs at this electrode.

In the 600-H.P. furnaces (fig. 2) using 4,000-5,000 volts the length of arc is about 5 metres. In the 1,000-H.P. ones using a higher voltage, the length is about 7 metres. Still larger furnaces, absorbing 2,000 H.P. each, are in contemplation. The supply is usually a three-phase one—the furnaces being used with star connection. After passing the arc and the upper cooler the hot gases pass downwards between the central part of the furnace and the outer concentric case, and from here into a steam boiler which serves as a further cooler, and whose steam serves to concentrate the products of the process.

It will be seen that the fresh air as it enters the furnace passes first upwards in the chamber immediately within the outermost chamber, and becomes partly heated here. Just below the upper cooler the air is reversed, and travels downwards in a third compartment, becoming further heated through the walls of the inner chamber by the arc, and finally entering the arc chamber in a well-warmed condition by the openings S. The vertical arrangement of the furnace is not essential, as horizontal ones have been tried, and the arc is still found to burn steadily in the centre of the tube. Even bent tubes, conical tubes, &c., have been used successfully. It is also unnecessary to admit all the air at one set of openings S, as it can be admitted at successive points along the tube, and in this way any desired length of arc can be attained. The stability of the arc is so great that nothing but the most serious disturbances, such as short-circuits of the supply line, or sudden and excessive changes in the air admission, put it out.

The steadiness of the arc is well brought out by the voltage curve. In fig. 3 curve *a* shows an oscillogram of the voltage across the arc, curve *b* shows the same for an ordinary arc lamp, and curve *c* for the Birkeland-Eyde arc. It will be seen that the sudden peak of voltage at the re-striking of the arc shown in *b* and *c* is absent in curve *a*.

The power factor of these arcs is, therefore, also good—ranging from ·92 to ·96. The explanation of the difference from the ordinary arc seems to be that in these long arcs practically the same gas particles serve as current carriers for a number of successive periods, and so the resistance variations from instant to instant are minimised. New air particles, of course, constantly enter at one end, and gas particles leave at the other, but their numbers are small compared with the total number of particles forming the arc at any one instant.

The potential in the arc has been investigated by means of an auxiliary electrode, and it is found to be fairly uniformly distributed along the whole length. Measurements of the nitric acid concentration along the arc are not so easy to carry out, but, as would be expected, the concentration increases towards the centre and the top of the furnace.

Coming next to the question of the utilisation of the energy, it is found that the energy actually used in the formation of the nitric oxide amounts to only some 3 per cent. of the total energy. Over and above this, however, a large quantity of highly heated air results as a by-product, although only a small fraction of the energy in this has hitherto been made use of. An investigation of the Badische A. & S. furnace shows that about 40 per cent. of the heat conveyed to the arc is obtained in the form of hot water, 17 per cent. is lost by radiation, 30 per cent. is used in the steam boiler, and a further 10 per cent. has to be removed from the hot gases by water cooling after they have passed the boiler. The remaining 3 per cent. alone is used in the formation of the nitric oxide. It is to be expected that more of this waste heat will be employed in time.

At Notodden the weak nitric acid solution is allowed to act on carbonaceous lime directly. This weak lime solution is dried in vacuum chambers by means of heat from the arc gases, and when crystallised, the cake is broken up into small pieces in mills and is packed in 100-kg. casks. The material so produced has now been on sale for several years. It is of uniform quality with a content of 13 per cent. of nitrogen, whilst Chile saltpetre has about 15 per cent. Besides the experimental works at Ludwigshafen and at Kristianssand, and large extensions to the factory at Notodden, in which the Badische A. & S. process will be employed, a still larger installation is being erected at Rjukau, in Telemarken (Norway). Here a waterfall of 560 m. is available, with a flow of 47 m.³ per second, so that a total of 250,000 E.H.P. can be obtained. The fall is to be used in two stages of 280 m. each; the first stage is to be equipped with ten 14,000-H.P. turbines, and is to be ready for the production of saltpetre by 1910.

Negotiations are also in hand in connection with a 50,000-H.P. water supply at Salzach, in Southern Germany, and for two waterfalls at Matre and Tyn, in Western Norway. These will all be under the combined control of the Badische Anilin und Sodafabrik and the Hydro-Electrische Stickstoffgesellschaft, which works the Birkeland-Eyde patents.

PROCEEDINGS OF INSTITUTIONS.

Faraday Society.

At the meeting of the Society held on June 10th, subjects so apparently diverse as the conservation of water for power and electric steel smelting were discussed by a well-attended meeting, which seemed, on account of the presence of some well-known American electrochemists, something like an echo of the recent International Congress of Applied Chemistry. The subjects are, of course, in reality very closely connected; the more amply and generously is power placed at the disposal of the electrochemist, the more chance have his methods of becoming generally applied.

The National and International Conservation of Water for Power.

This was the subject of an address given by Mr. E. R. Taylor, of Penn Yann, N.Y., who is well known as the inventor of the electric furnace method of manufacturing carbon bisulphide, but who is now devoting his energies and enthusiasm to teaching the people of America and Europe the folly of allowing to run to waste vast

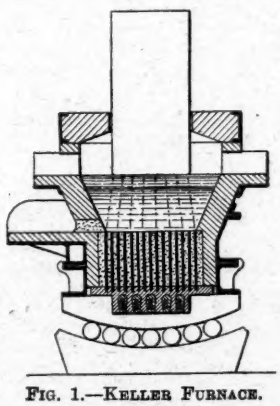

Fig. 1.—Keller Furnace.

stores of natural power and natural sources of agricultural wealth whose very existence at present seems to pass unnoticed. Mr. Taylor's plea, in a word, is for the civilised nations of the world to impound, as far as possible, the flood-waters which fall in such abundance—often executing great damage—on the uplands of the earth, and to utilise the water so impounded for irrigation purposes in the lowlands and as a source of power, vast in the aggregate, in its fall from higher to lower levels. Again, in many parts of the world, the flood waters carry down with them the soil, entirely denuding the uplands until they become useless wastes. Mr. Taylor showed on the screen a view of some arid Chinese uplands which 200 years ago were covered with timber. By impounding the rainfall in such regions, not only is one conserving water and conserving power, but forests will be created, which are in every way a source of wealth (and a source of beauty) to the regions in which they have sprung up. As an example of what can be done on a small scale, but which could probably be repeated by countless individuals all over the world, Mr. Taylor showed some views of a small brook on a farm in America, from which the enterprising owner, by making a simple dam of stones, has developed 25 H.P., which is utilised on his farm. From this little brook 2,225 H.P. could be developed—equivalent to 30,000 tons of coal a year. The water-power capacity of the whole of the United States is not less than 150 million H.P.; of the annual stream flow of the country from 85 to 95 per cent. is wasted in flood. No doubt conservation cannot be carried out in countries like England, where land is extremely valuable, to the extent possible in America, but America has now led the way, inspired by the action of the late President, to a serious national consideration of this great problem, and it is to be hoped that the Governments of Europe will not lag behind. Mr. Taylor strongly urged the necessity for the problem to be considered internationally, and he pointed out that a beginning is to be made in 1910, when a conference will be held at the Hague. It is gratifying to be able to

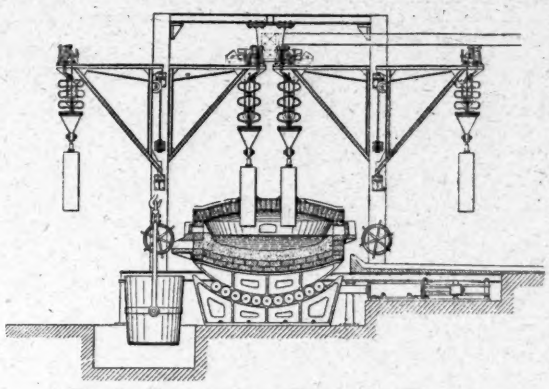

Fig. 2.—Keller 10-ton Furnace at Unieux

report, what was stated at the meeting by Mr. Walter Reid—that the President of the Local Government Board has recently promised to take definite action in at least one direction, namely, with regard to the conservation of our English rivers, each of which is to be placed under the control of one central authority, subject to the supreme direction of the Local Government Board. This is a step in the right direction, and it may, at least it is to be hoped it will, have the effect of bringing into utilisation the many small waterfalls existing in this country, to say nothing of the general downward flow of our large rivers, which, if small individually, are by no means negligible in the aggregate.

Electric Steel Smelting.

Under the title "A Contribution to the Study of Electric Furnaces," M. Keller, the distinguished French electrometallurgist, made a communication to the Society of considerable interest, in which he advocates the extended use of the type of furnace in which a conducting hearth—which must be non-carbonising—forms one of the electrodes. This was the method used by Siemens in his original furnace (1880), but the type mostly employed at the present day is that perfected, among others, by Héroult (and by M. Keller himself), in which two, or more, electrodes dip into the bath suspended from above, the current entering by one, or one pair, usually through the medium of an arc, and leaving by the other. Of course the construction of this type of furnace is very simple, and only half the current density is necessary for the same output as is employed in the other type, thus economising electrical connections; but these furnaces have the disadvantage of not allowing the current to flow uniformly through the whole mass of molten

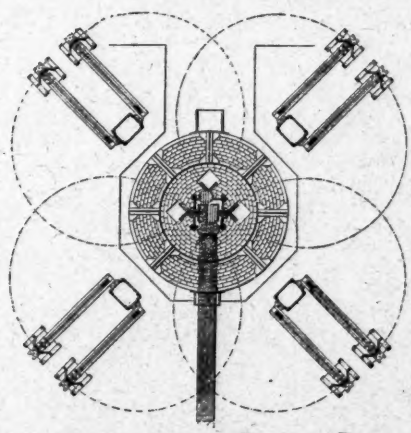

Fig. 3.—Keller 10-ton Furnace: Plan.

metal, and the product is consequently not likely to be so homogeneous as where it flows from one upper electrode, through the bath, to a lower electrode. M. Keller, in this paper, advocates the extended use of the "conducting-hearth" furnace, and he describes a type which ensures a uniform current density over the whole base of the furnace. Previous forms of conducting hearth consist either of metal only on one or more metallic poles embedded in a non-carbonising masonry (Siemens, Borchers and Girod), or else of refractory material, such as magnesia or silica, rendered conducting by a carboniferous substance (the new Firminy type). M. Keller,

however, uses a hearth consisting of a "reinforced clay," made up of iron bars 25 to 30 mm. in diameter, placed vertically 25 to 30 mm. apart and packed solid with magnesia, by preference (see fig. 1, p. 37). When cold, only the bars are conducting, but when in operation, the hearth is conductive over its whole section, and the electrical resistance is very small. The mechanical resistance of such a hearth to the subsidence of the metallic bath is very considerable, and the author states that the bottom of the furnace is absolutely indeformable. The hearth of a 1,500-kg. furnace, examined after many months' service, was in exactly the same condition as when it started. The

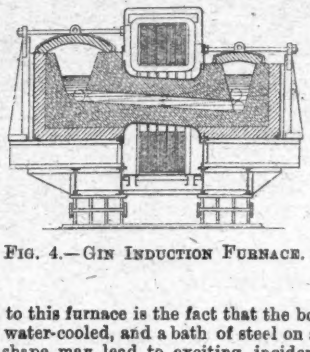

Fig. 4.—Gin Induction Furnace.

grave objection to this furnace is the fact that the bottom electrode will have to be water-cooled, and a bath of steel on a foundation of water in any shape may lead to exciting incidents, to say the least. Many of those who took part in the discussion, Mr. Morrison, Mr. Ristori and Mr. Cobb, among others, considered the water-cooled electrode an insuperable objection to this type of furnace; it is probably a question that experience will ultimately have to decide. The 10-ton Keller steel furnace used at the Holtzer works at Unieux—probably the most important of its kind in actual operation—for finishing the manufacture of a steel already molten in a Martin furnace, is of the vertical electrode type, with, however, four instead of two electrodes, each pair of which is capable of independent regulation, so that the operation of the furnace is under complete control (figs. 2 and 3). This method of central distribution of current into the furnace results in very small self-induction; the power factor is as high as 0·97, when a great current like 12,000 amperes is passing. This furnace purifies the steel until the phosphorus and sulphur together only total 0·01 per cent. The type is particularly adaptable for three-phase current, the electrodes being connected either in mesh—one of the three electrodes to each phase—or in star, in which case the armoured clay hearth of the furnace is connected to the middle point of the three-phase system. In the opinion of M. Keller there is no reason why a 20-ton three-phase furnace, of about 1,800 kw. capacity, should not now be constructed. Such a furnace could purify 250 to 300 tons

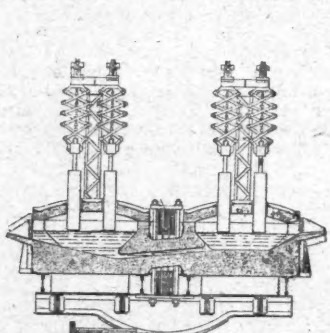

Fig. 5.—Combined Electrode and Induction Furnace.

of steel per day, obtained from a converter, at an operating cost of 12s. to 16s. per ton, with electricity at 0·15d. per unit, such as would be obtainable by utilising blast-furnace gas.

A paper by M. Gustave Gin described a suggested improved form of induction furnace (fig. 4), also for steel refining, in which the molten material is in continual circulation, so as to ensure homogeneity of treatment and of product. The two crucibles which form the main part of the furnace are connected together by inclined channels, the whole arrangement forming the closed secondary circuit, in which general circulation is caused by the higher temperature generated in the cross channels. It is claimed that with this type of furnace the ohmic resistance of the circuit can be increased without correspondingly altering its self-induction, thus allowing furnaces with a high power factor to be constructed, and generators and transformers of normal frequency and size to be employed.

The same principle of cross-connections to facilitate circulation can obviously be applied to ordinary electrode furnaces, or to combined electrode and induction furnaces (fig. 5), which are now coming into use, although whether practical difficulties are likely to arise with the use of these channels, whose resistance will be high, and in which a good deal of local heat will be generated, is a question which only experience can decide.

Physical Society of London.

At the meeting held June 11th, 1909, a paper by Dr. Russell and Mr. Arthur Wright on "The Arthur Wright Electrical Device for evaluating Formulæ and solving Equations" was read by Dr. Russell. In this device special slide resistances are used. If R be the resistance of one of these and a metallic finger make contact with it at a point where the scale-reading is x, the resistance between this finger and the terminal of the slide is R/x. The scales of the slides are graduated logarithmically as in the ordinary slide-rule; hence the processes of multiplication and division can be done mechanically by sliding them against exactly similar fixed scales. If one connects a number of these slide resistances in parallel, since the current is inversely proportional to the resistance, the sum of the currents through them will be proportional to the sum of the readings of the contact fingers. One can easily balance by a null method this current against the current going through a single slide resistance x by means of a Wheatstone-bridge arrangement; in this case the reading on x when there is a balance gives the sum of the readings on all the other slides. Similarly one can subtract numbers by putting slides representing these numbers in parallel with x, and then obtaining a balance by altering the reading on x. The variable arms of the bridge can be usefully employed in making the calculations.

A model of this device for solving an equation of any degree consisting of not more than four terms was shown. The inaccuracy of the results found by means of this model is of the order of one per cent. Approximate values of the imaginary roots of numerical equations can be found by the device, and it can be employed to solve very complicated equations.

A paper entitled "The Proposed International Unit of Candle-Power" was read by Mr. C. C. Paterson. The paper discusses the units of candle-power at present officially accepted in Great Britain, France, the United States of America and Germany. The numerous intercomparisons which have taken place during the past five years between these units show that the candle, as interpreted in France, Great Britain and the United States respectively, has practically the same value in the three countries. The authorities in the gas and electric interests in the United States are prepared to adjust their units of candle-power to bring them to a single value, which is to be the same as the British and French units. The paper gives the results of comparisons showing that within the limits of experimental error the British and French units are identical. The change involved in the unit at present maintained at the Bureau of Standards, Washington, is shown to be 1·6 per cent. The proposal to call the common unit of light to be maintained jointly by the National Standardising Laboratories of America, France and Great Britain the "International Candle" has been submitted to the International Electrotechnical Commission, and through it to all the countries of the world which are represented on that Commission. The Hefner unit is shown to be almost exactly $\frac{9}{10}$ths of the new unit. The comparisons between the units have been made by two methods:—(1) Direct comparisons of the flame standards in France, Germany and Great Britain. (2) Through the medium of electric sub-standards which have had values assigned to them in the National Laboratories of the four countries.

The agreement between the ratio values by the two methods is very close, and is shown by a table giving the results of the various comparisons which have been made.

Dr. Fleming said that he greatly regretted that the National Physical Laboratory authorities had acquiesced in the adoption of a flame standard of light, with all its difficulties and variabilities. Influenced as they are by atmospheric pressure, moisture, CO_2, height of flame, composition of fuel and number of persons in the photometric room, these flame standards could not possibly be considered as a final solution of the problem of obtaining a primary standard of light. What was really required was the concrete realisation of a permanent primary standard, which would be the standard of reference for secondary standards like the Fleming-Ediswan large-bulb glow-lamp standards, which he had introduced seven years ago. Prof. Petavel had shown that with suitable precautions the unit of illumination could be reproduced within 1 per cent. by means of the Violle molten platinum standard.

Dr. Russell said that the *bougie décimale* was the unit adopted by the International Congress of Electricians in 1889, and was defined to be the twentieth part of the Violle standard. He was not prepared to accept that it was equal to 1·11 Hefner units. Waidner and Burgess had proposed to adopt as the unit of intensity the radiation from a square centimetre of a black body maintained at the temperature of fusion of platinum.

Mr. Dow said the pentane lamp as a standard was not very inferior to the Violle standard. He did not think they could as yet accept as a standard an area of a black body at a high temperature.

Dr. Drysdale thought the international agreement was simply an attempt to obtain agreement between present existing units rather than standards, and left the matter of the best form of standard perfectly open. Every one having experience with flame standards would thoroughly agree with Prof. Fleming's condemnation of them, and there could be no doubt that the primary standard should be an incandescence one. He, however, did not agree with Dr. Fleming's suggestion of reviving the Violle standard. It seemed decidedly preferable to suggest a unit area of a black body at a definite temperature. Mr. Jolley and he had come to the conclusion that a square cm. of a black body at a temperature of 2,000° absolute would perhaps be a good unit and would be probably of the order of 100 candle-power. This temperature was probably pretty close to that of the ordinary carbon-filament glow-lamp, so that there should be no colour

difficulty and it should not be exceptionally difficult to maintain constant. A point in favour of the black body was the perfectly definite character of its spectrum, which made it a standard of colour as well as intensity and suitable for spectro-photometric comparison. As the surface would be that of a solid, it would be unnecessary to maintain it in a horizontal position, as with the Violle standard, and the amount of light could be easily varied by a diaphragm.

Prof. C. H. Lees said that Prof. Petavel's recent work on the radiation from heated platinum strips suggested that he was not altogether satisfied with the Violle standard.

Mr. Paterson thought that Dr. Fleming had probably misunderstood the object of the paper, which dealt with the relations existing between the various units now in use. He did not think it would be possible to keep the temperature of a black body sufficiently constant to enable it to be used as a standard.

A paper on "Inductance and Resistance in Telephone and Other Circuits" was read by Dr. J. W. Nicholson. A general formula for the effective inductance of a circuit consisting of two long parallel wires has been given by the author, and is suitable for cases in which the current distribution in either wire is greatly affected by the frequency of alternation. In the present paper certain important cases are examined in detail, and formulæ are obtained capable of immediate use. A calculation of the effective resistance is also made in each case. Attention has been mainly directed to that of the simple telephone circuit, in which the leads are not twisted round each other in order to annul the inductive effects of the earth and of neighbouring circuits. To all metals used in practice, except iron, the formulæ developed for copper wires may be applied with a nearly identical order of accuracy.

THE ROYAL SOCIETY CONVERSAZIONE.

The second conversazione of the Royal Society was held at Burlington House on June 24th. There were few exhibits of striking novelty that would interest the physicist or the electrical engineer. We notice below the more important exhibits which we have not already described in connection with the last conversazione.

The "Pauflen" spring wheel for motor vehicles exhibited by the Hon. R. C. Parsons is an ingenious contrivance to replace the pneumatic tire. The outer rim of the wheel which runs on the road is completely detached from the inner wheel; this is furnished with radiating spiral springs running on the inner surface of the outer rim, which plays the part of an endless track laid down by the vehicle as it advances. A series of curves drawn by a seismographic apparatus carried on the car appeared to demonstrate that there was less vibration with the "Pauflen" wheels than with the pneumatic tire.

The Linolite Co. exhibited "Tubolite" lamps fitted with a metallic filament which is held at each end by a zigzag spring to take up the expansion, and is supported by anchors at two intermediate points. The lamp may be placed in any position, and can be run on an alternating or direct-current circuit. Every point of the filament is in the same position with regard to the reflector (and there is a larger reflecting surface than can be used with a bulb lamp), which ensures uniformity and efficiency in the distribution of the light.

Mr. W. M. Mordey demonstrated the effect of electrostatic condensers in preventing or extinguishing arcs. A suitable condenser placed in shunt to an arc or in shunt to a resistance in series with an arc will instantly extinguish the arc. If connected in shunt to the contacts before they are separated, it will prevent the formation of an arc even in a circuit having considerable electromotive force. The condenser is effective whether, when applied, it is in the discharged condition or charged to the full E.M.F. of the circuit. In the latter case the charge may be in either direction of polarity.

The Hon. C. A. Parsons exhibited a model of a leakage path device for regulating the voltage of alternators. The apparatus depends on the principle that, while an alternating current cannot directly produce a uni-directional field, it can have a strong action in diminishing magnetic flux. When it is applied to an alternator, the field magnets of the exciter are provided with a leakage path around which windings carrying alternating current are placed. It will be seen that when the current is passing in one direction it cannot appreciably increase the "leakage flux" through the core owing to this being already saturated; but when it reverses and flows in the other direction it will reduce the leakage flux. The model shown consisted of a direct-current motor driving a three-phase alternator with its exciter. Bridging the poles of the exciter was a laminated iron construction having three cores or leakage paths. Each of these cores carried a winding which was in series with one of the phases of the alternator. An artificial load of resistance wire was provided, and by means of a two-way switch the load could be put on with or without the leakage-path coils in circuit, so that the regulation of the alternator could be compared with and without the compounding. When there is no load on the alternator, the coils on the leakage paths are inactive, and the diversion of flux from the exciter armature keeps the exciter voltage, and thus the alternator field, low. When the load is put on the alternator, with the current flowing through the leakage-path coils, these coils choke back the leakage flux. The result is to increase the flux through the exciter armature, raise its voltage, and so automatically increase the alternator excitation and keep its voltage constant. The action is practically instantaneous, since the load current of the alternator is used directly to effect the regulation, without the intervention of any mechanical apparatus.

Mr. C. E. S. Phillips exhibited a permanently luminous watch dial and military night compass. The watch dial is transparent (glass), and the figures are painted on its upper surface. The dial is backed with a compound containing a minute quantity of radium bromide, which renders it luminous, so that the time may be easily read in the dark. The compass is arranged on the same principle. By means of a luminous disk and strip, direction may be determined at night.

Mr. S. Cowper-Coles exhibited specimens of metallic parabolic reflectors made by electro-deposition. The specimens of parabolic glass mirrors were coated with gold, copper and palladium. Specimens were also shown coated with gold and silver bands so as to give greater penetration in foggy weather, and yet retain the dazzling effect required for military purposes.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

DUTCH E. INDIES.—The following duties are payable:—

Cement	free
Coal and coke	free
Copper sheets and plates and brass or bronze wire for telephones and similar wire for conducting electricity	free
Copperware, bronzeware, brass wire, &c., not specially mentioned in the Tariff	10 % ad val.
Earthenware and porcelain	6 "
Engines for factories and steam engines, machinery, instruments, tools, and implements for agricultural, manufacturing, engineering and mining, professional and trading purposes, also parts thereof	free
Lamps not required for gas or electric light	10 % ad val.
Glass and glassware of all kinds	10 "
Instruments, mathematical, physical, surgical and optical	free
Iron in bars, pieces, rods or sheets, rails, conduct pipes, gas pipes, axles, boxes, wheels, cast or wrought, frames of iron buildings, sheds or warehouses, iron bridges and parts thereof, iron roofing and gutters, whether galvanised or not, bolts and nails, iron wire, wire for telegraph and telephone purposes and cables	free
Ironwork, cast, wrought, flattened or forged, not specially mentioned	10 % ad val.
Leadware not specially mentioned	10 "
Leather and leatherwork	10 "
Petroleum, per hectolitre	·25 florin
Pitch	free
Resin	free
Steel in bars, sheets and plates, steel ropes, axles, and rails, steel joints and junction plates for railways	free
Steelware not specially mentioned	10 % ad val.
Goods not specially mentioned in the Tariff	6 "

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

13,887. "Improvements in the enumeration of telephone calls." S. D. Williams. June 14th.

13,892. "Improvements in the construction of sparking plugs for internal combustion engines." R. F. Drury. (Société l'Oleo, France.) June 14th. (Complete.)

13,897. "Improvements in electrical relays." R. M. Abraham and British Pneumatic Railway Signal Co., Ltd. June 14th.

13,908. "Improvements in or connected with means for giving an initia impulse to magneto-electric sparking machines used in connection with internal combustion engines." G. Braud. June 14th.

13,911. "Automatic fire-alarm electric bell push." J. Laxton. June 14th.

13,919. "Improvements in telephone exchanges." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) June 14th. (Complete.)

13,922. "Improved microphone for currents of high intensity." A. Steinacker and A. Plisnier. (Date applied for under Sec. 91 of the Act, January 16th, 1909, being date of application in Austria.) June 14th. (Complete.)

13,961. "Improvements in and relating to electric heating devices." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) June 14th.

13,962. "Improvements in and relating to electric meters." British Thomson-Houston Co., Ltd. (Date applied for under Rule 13, May 29th, 1909. An invention comprised in Application No. 12,689/09. June 14th.

13,989. "Improvements in the manufacture of electric incandescent lamps." M. Milch. June 15th.

14,012. "Improvements in and relating to antiseptic devices for telephones." E. A. Pickering. June 15th.

14,019. "Improvements in electrical motors and the like." S. Pinkus. June 15th.

14,034. "Improvements in mechanical telegraphs, particularly applicable to vehicles and the like." J. D. Owen. June 15th.

14,059. "Improvements in electric time switches." J. G. Mehne. June 15th. Complete.)

14,062. "Improvements in and relating to metal boxes for switches and wall plugs." C. A. Backman. June 15th. (Complete.)

14,091. "Arrangement for uniform and rapid electro-plating of flat or other sectional shaped articles." Langbein-Pfanhauser-Werke Akt.-Ges. (Date applied for under Sec. 91 of the Act, June 22nd, 1908, being date of application in Germany.) June 16th. (Complete.)

14,093. "Improvements in electrically-operated point-actuating mechanism for tramway or the like tracks." A. P. Williams. June 16th.

14,097. "Improvements in or connected with electrical switches." I. V. Zealander and P. Conway. June 16th.

14,117. "Improvements in electric contact breakers particularly applicable for induction or sparking coils." R. W. Grant. June 16th.

14,120. "Improvements in electrical contact apparatus actuated by the passage of trains to control railway points and signals." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) June 16th. (Complete.)

14,126. "Improvements in magneto-electric apparatus for firing electric igniters." W. E. Lake. (Fabrik Elektrischer Zünder G.m.b.H., Germany.) June 16th. (Complete.)

14,128. "Improvements in or relating to arc lamps." A. J. Boult. (Voigt and Haeffner Akt. Ges., Germany.) June 16th. (Complete.)

14,153. "Improvements in and relating to magneto-electric machines." E. Troike. June 16th. (Complete.)

14,164. "Improvements in and relating to electric locks." J. Xabski. June 16th.

14,165. "Improvements in electric arc lamps." O. Millauro. June 16th. (Complete.)

14,168. "Improved variable-speed dynamo." A. G. Inrig. June 16th.

14,209. "Improvements in and relating to telephonic transmitter and the like." J. K. Pickford. June 17th.

14,212. "Improvements in methods of charging and discharging secondary batteries or electric accumulators on three-wire systems." A. M. Taylor. June 17th.

14,239. "Improvements in telephone exchanges." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) June 17th. (Complete.)

14,240. "Improvements in signalling apparatus operated from a distance." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) June 17th. (Complete.)

14,244. "Telephone system." D. W. May. June 17th. (Complete.)

14,288. "Improvements in electrolytic apparatus having a liquid anode." O. Schott and C. Z. Stiftung (trading as Schott & Gen). (Date applied for under Sec. 91 of the Act, June 26th, 1908, being date of application in Germany.) June 18th. (Complete.)

14,330. "Improvements in and relating to the electrical operation of gun mechanism and the like." H. C. Leake. June 18th.

14,362. "Improvements relating to the fault protection of cables in electrical current distribution systems." W. C. H. M. Georgi and A. Reyrolle & Co., Ltd. June 18th.

14,363. "Improvements in direct-working telephones for intercommunication purposes." E. A. Davis. June 19th.

14,391. "Improvements in dynamos or electrical motors." J. H. Garty. June 19th. (Complete.)

14,398. "Improvements in electric switches and switch fuses." H. H. Berry and W. J. Markham. June 19th.

14,431. "New or improved method of and means for preventing the pulsation of electric currents generated by small dynamos and rotary converters." A. Schulzer. June 19th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1908.

Electrolyte for Use in Electric Batteries. New Ignition Syndicate and W. J. L. Sandy. 10,520. May 14th.

Electric Power Hammers. R. Berry. 10,589. May 15th.

Electrical Driving Devices for Clocks. A. Anders. 10,626. May 15th. (Date applied for under International Convention, September 11th, 1907.)

Electrical Driving Devices for Clocks. A. Anders. 10,627. May 15th. (Date applied for under International Convention, March 28th, 1908.) (Application for Patent of Addition to No. 10,626/08.)

Manufacture of Filaments for Electric Incandescent Lamps. Wolfram Lampen Akt.-Ges. 10,691. May 19th. (Date applied for under International Convention, October 7th, 1907.)

Induction Coils. J. B. Brooks and F. H. Alston. 11,170. May 22nd.

Dynamo-Electric Machines. Siemens Bros. Dynamo Works and M. Kloss. 14,049. July 2nd.

Electric Regulating Devices. British Thomson-Houston Co. (General Electric Co., United States.) 14,701. July 10th.

Accumulator Electrodes. C. Vogel. 14,814. July 13th.

Retransmitting and Reinforcing Telephone Currents. J. E. Kingsbury. (Western Electric Co.) 17,047. August 13th. (Application for Patent of Addition to No. 11,6.5/05).

Current-Collecting Rings for Dynamo-Electric Machines. British Thomson-Houston Co. (General Electric Co., United States.) 17,380. August 18th.

Manufacture of Refractory Electric Conductors. W. P. Coolidge. 17,621. August 21st. (Date applied for under International Convention, August 24th, 1907.)

System of Fitting Incandescent Electric Lamps. G. Weissmann. 18,233. August 31st. (Date applied for under International Convention, January 10th, 1908.)

Regulation of Alternating-Current Electric Generators Working in Parallel. Siemens Bros. Dynamo Works. (Siemens Schuckertwerke Ges.) 18,715. September 7th.

Suspension of Trolley Wires for Electric Tramways and Railways. J. G. Scott. 19,621. September 18th.

Safety Device for Portable Electric Hand Lamps. J. Lightfoot. 19,679. September 19th.

Emergency Brake for Electric Tramcars and other Vehicles. T. Jones and L. J. Evans. 24,766. November 18th.

Process for Production of Pure and Thin Filaments of any Length for Illuminating Purposes. A. Kroll and B. Saklatwalla. 27,144. December 14th. (Date applied for under International Convention, October 26th, 1908.)

Third-Rail Insulators. P. M. Justice. (Essex Co.) 27,477. December 17th.

Magneto-Electric Sparking Apparatus. W. P. Thompson. (E. Eisemann and Co., Ges.) 27,999. December 23rd.

Electric Treatment for Curative and other Purposes. H. Wartmann. 27,512. December 18th.

Electrical Advertising Devices. W. K. L. Dickson. 28,135. December 24th.

Processes for Producing Metallic Articles by Electrodeposition, and Articles so Produced. F. I. Gibbs. 4,410. February 27th.

Apparatus for Reinforcing the Insulation of Electrical Apparatus with Lacquer or Varnish. J. F. Simpson and A. W. Brown. 9,090. April 27th.

Telephony and Telegraphy. Brown. 11,135. May 22nd.

Electrical Circuit Breakers. B. Thomas and E. Thomas. 11,183. May 23rd.

Measurement of Intensity and Tension of Electric Currents Delivered by an Induction Coil. F. Klingelfuss. 11,299. May 25th.

Dynamo-Electrical Machinery Subject to Fluctuation of Load. Electric Construction Co. and W. Buchanan. 11,336. May 25th.

Control of Electric Circuits and Apparatus. British Thomson-Houston Co. (General Electric Co., United States.) 11,345. May 25th.

Electric Light Reflector and Shade. Mygatt. 11,539. May 27th.

Electric Lighting of Roundabouts and the like. H. M. Darrah and L. A. Hackett. 11,758. May 30th.

Commutators for Dynamo-Electric Machines. C. A. Parsons and A. H. Law. 11,871. June 1st.

Motor-Controlled Switches. A. J. Barlow. 12,508. June 10th. (Post-dated December 7th, 1908.)

Galvanic Element of the Bunsen Type. K. Heintz. 13,671. June 27th.

Reinforced Wooden Support for Electric Insulators. C. Graham. 15,342. July 20th.

Dynamo-Electric Machines. Burleigh. 15,427. July 21st.

Means of Connection between Electrical Conductors. E. Rayner and Chillington Tool Co. 16,060. July 29th.

Electro-Therapeutic Apparatus. J. Purthner, F. Zimmerl and J. Böck. 16,772. August 10th.

Electric Fuses. W. White. 17,170. August 15th.

Locomotive Electric Alarm Systems. A. Cummings and G. Noreau. 27,923. December 23rd.

Control of Alternating Electric Current Motors of the Commutator Type. British Thomson-Houston Co. (General Electric Co., United States.) 6,963. March 28th.

Alternating-Current Dynamo-Electric Machines of the Commutator Type. Allgemeine Elektricitäts Ges. 11,633. May 28th. (Date applied for under International Convention, May 29th, 1907.)

Apparatus of the Resonance Type Applicable for Use in Indicating or Measuring the Frequency of Electrical or Magnetic Alternations. R. Hartmann-Kempf. 11,870. June 1st. (Date applied for under International Convention, May 31st, 1907.)

1909.

Electric Condensers. R. Schiessler. 4,028. February 18th. (Date applied for under Rule 13, March 30th, 1908.)

Magnetic Brakes. J. N. Mahoney and O. S. McCurdy. 8,521. April 8th. (Date applied for under International Convention, April 20th, 1908.)

Metal Filaments for Electric Lamps and the Process of Manufacturing the same. H. Kuzel. 1,332. January 19th. (Date applied for under International Convention, February 22nd, 1908.)

Antiseptic Attachments for Telephones. F. C. Tabler. 1,498. January 21st. (Date applied for under International Convention, January 24th, 1908.)

Telephone Exchanges. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 5,904. March 11th.

Means for Preventing the Corrosion of the Internal Parts of Boilers due to Electro-Chemical Action. P. E. G. Cumberland. 8,068. April 3rd.

Apparatus for Electroplating. R. E. Philips. (Meaker Co.) 5,087. March 2nd.

Device for Identifying an Electric Lead with its Terminal. C. Isaac. 7,398. March 26th.

Electric Furnaces for the Treatment of Gases or Gas Mixtures. Salpetersaure Industrie Ges. 8,443. April 7th. (Date applied for under International Convention, May 22nd, 1908.)

Trolleys or Collectors for Electrically-Driven Vehicles. S. Bryan. 747. January 12th.

Ignition Device for Internal-Combustion Engines. P. R. J. Willis. (W. H. R. Mildebrath.) 868. January 13th.

Apparatus for Use in Connection with Electric Cables. Beaver and Claremont. 2,076. January 28th. (Date applied for under Rule 13, March 23rd, 1908.)

Electric Fuses Fitted with Indicating Devices. C. C. Hatry. 2,353. February 1st.

Sewing Machine Guides for Hat Sweats. W. Fairweather. (Singer Manufacturing Co.) 4,941. March 1st.

Safety Device for the Dissipation of Excess Voltage in Electrical Systems. G. Giles. 4,997. March 1st. (Date applied for under International Convention. March 2nd, 1908.)

Telephones. A. H. Nicholson. 6,523. March 18th.

Electrical Rail Bond. W. Leder. 7,635. March 30th. (Date applied for under International Convention, June 6th, 1908.)

Electric Fuse Fittings. Siemens Bros. Dynamo Works. (Siemens & Halske Akt.-Ges.) 8,363. April 6th.